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Journal of Educational Research

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JOURNAL OF EDUCATIONAL RESEARCH

This journal was established to support educational research workers in all phases of the great problems of teaching. Started in 1920 under the editorship of Dr. B. R. Buckingham and associates among the members of an association of directors of educational research, and accepted as the official organ of the Educational Research Association, its purpose has at no time been confined to a narrow line of specialized research but has been concerned also with professional applications for all workers in education.

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JOURNAL *of* EDUCATIONAL RESEARCH

Volume XIX FEBRUARY 1929 Number 2

SOME SIGNIFICANT RESULTS OF THE MODERN FOREIGN LANGUAGE STUDY[1]

V. A. C. HENMON
University of Wisconsin

THE Modern Foreign Language Study completed last year the three year period allotted for the investigation and the results have appeared or are appearing in a series of volumes or monographs. Instead of a single report there will be seventeen volumes dealing with different aspects of the modern foreign language study problem.[2]

A glance at the list of volumes shows that the Study has concentrated its special efforts, apart from statistical and questionnaire studies, on

[1] Published in part in the Proceedings of the Ohio State Educational Conference and the Institute of Higher Education, University of Minnesota.

[2] The complete list of published and projected volumes by the American and Canadian Committees is as follows:

Vol. I. New York Experiments with New-Type Modern Language Tests. By Ben D. Wood.
Vol. II. A Laboratory Study of the Reading of Modern Foreign Languages. By G. T. Buswell.
Vol. III. A Graded Spanish Word Book.* Compiled by Milton A. Buchanan.
Vol. IV. Enrollment in the Foreign Languages in Secondary Schools and Colleges of the United States. Compiled by C. A. Wheeler and Others, with introduction and analysis by Robert Herndon Fife.
Vol. V. Achievement Tests in the Modern Foreign Languages. By V. A. C. Henmon.
Vol. VI. Modern Language Instruction in Canada,* Part I.
Vol. VII. Modern Language Instruction in Canada,* Part II.
Vol. VIII. An Annotated Bibliography of Modern Language Methodology.* Compiled by Milton A. Buchanan and E. D. MacPhee.
Vol. IX. German Frequency Word Book. Arranged and edited by B. Q. Morgan.
Vol. X. German Idiom List. Compiled by Edward F. Hauch. In Press.
Vol. XI. Spanish Idiom List. Compiled by Hayward Keniston. In Press.
Vol. XII. The Teaching of Modern Foreign Languages in the United States. By Algernon Coleman. In Press.
Vol. XIII. The Training of Teachers of the Modern Foreign Languages. By C. M. Purin. In Press.
Vol. XIV. Prognosis Tests in the Modern Foreign Languages. In Press.
Vol. XV. French Word Book. Compiled by George E. Vander Beke. In Press.
Vol. XVI. French Idiom List. Compiled by F. D. Cheydleur. In Press.
Vol. XVII. Studies in Modern Language Teaching. In Press.

* The starred books are published by the University of Toronto Press, Toronto, Canada. The other volumes are published or will be published by the Macmillan Company.

projects—such as word, syntax, and idiom counts, and the construction of standard tests—which are so time-consuming and expensive and require such large coöperation that single individuals or institutions could not well undertake them.

ACHIEVEMENT TESTS

The Study was confronted at the outset with the necessity of constructing standard tests of achievement since none adequate to its purposes was available. No effective and convincing attack on fundamental, practical, and theoretical problems of learning and teaching the modern languages could be made without something in the way of measuring devices. What we can measure we can talk about convincingly. Tests are not ends in themselves, but they are indispensable as instruments of analysis. We cannot set standards of accomplishment in intelligible and realistic terms without them. Nor can we make accurate comparisons of attainments in different schools and classes under varying methods and conditions. Convincing investigation of the effects of varying ages of beginning a modern language, intelligence levels, methods, curricula, and objectives must necessarily wait on the production of valid, reliable, comprehensive, and administratively feasible tests. The Study has therefore given a large share of its time, energy, and resources to their construction and standardization.

The Study has sponsored or developed two batteries of tests for French, German, and Spanish—the Alpha tests for vocabulary, grammar, silent reading, and written composition, prepared by the Committee; and the Beta tests, prepared by Dr. Wood and his associates. Both test batteries are now published by the World Book Company. The Beta tests were developed for use in the junior high schools of New York City and the results of this experiment are reported in a monograph published by the Study. The Alpha tests have been widely administered in the United States and Canada. They have also been administered in schools in England and have been translated and tested out tentatively in Austria, Germany, France, and Russia. Interesting comparisons of an objective sort will thus be possible. While these tests are not perfect, they are far better than the opinions and subjective estimates which they are designed to replace. The major uses to which such tests may be put will all be recognized as fundamentally important—comparison of achievement in different schools and classes, more accurate classification and placement, experimentation on the effect of varying methods and conditions, diagnosis and prognosis, and the definition of objectives

in specific terms. In addition to these test batteries, Cheydleur, of Wisconsin, and Ford, of Toronto, have prepared and standardized French grammar tests, Van Wagenen has constructed a German reading scale, Buchanan and Goggio have prepared tests in Italian, and three or four tests of aural comprehension are in process of standardization. Two other batteries—the Iowa Placement Examinations, French Training and Spanish Training, and the Columbia Research Bureau Tests—provided a wealth of testing devices greater than that to be found in any other of the secondary-school subjects.

COMPARISON OF ACHIEVEMENT IN THE SCHOOLS OF CANADA, ENGLAND, AND THE UNITED STATES

The first outstanding fact shown by the administration of the tests is the difference in achievement in French in the secondary schools of

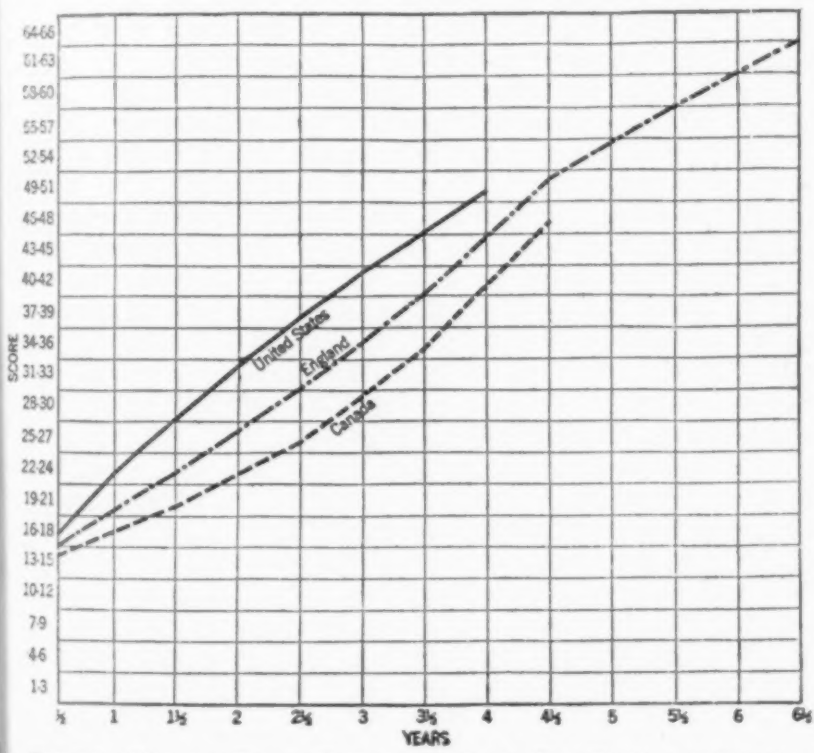

FIGURE 1. NORMS IN FRENCH VOCABULARY FOR THE HIGH SCHOOLS OF CANADA, ENGLAND AND THE UNITED STATES

Canada, England, and the United States. In addition to the administration of tests in Canada and the United States, eight thousand students were given the Alpha French Tests in England. Reliable norms in objective comparable terms in the four abilities measured by the tests—vocabulary, grammar, silent reading, and written composition—are available and it is a matter of interest to compare achievements in these countries in so far as these tests measure and reveal them. Figures 1 to 4 show these comparisons clearly.

It is evident that the norms for the high schools of the United States are significantly and uniformly higher than those for England and Canada in vocabulary, grammar, and reading. In composition, they occupy an intermediate position between those of England and Canada

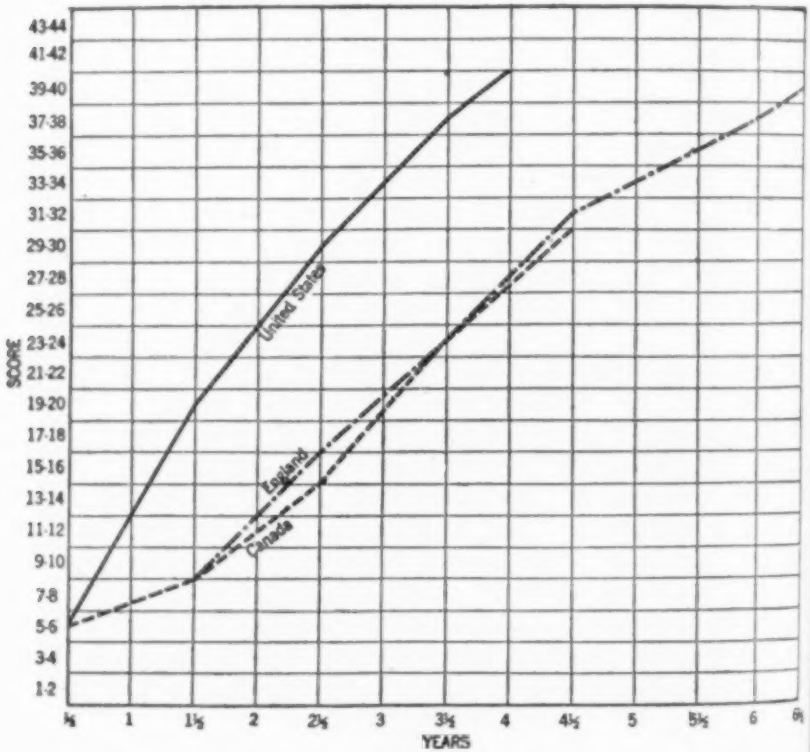

FIGURE 2. NORMS IN FRENCH GRAMMAR FOR THE HIGH SCHOOLS OF CANADA, ENGLAND AND THE UNITED STATES

up to the higher levels when they are surpassed by both Canada and England. The most striking difference is found in grammar and reading. In grammar, the English and Canadian norms coincide very closely throughout, but there is a range of difference of approximately two years between them and the norms for the United States. In reading the difference is almost as great. The norms in reading for the English schools are markedly below those for the United States, while the Canadian schools occupy an intermediate position. It is interesting to note that in the two measures of reading ability, vocabulary and silent reading, the Canadian norms are consistently higher in silent reading but as consistently lower in vocabulary.

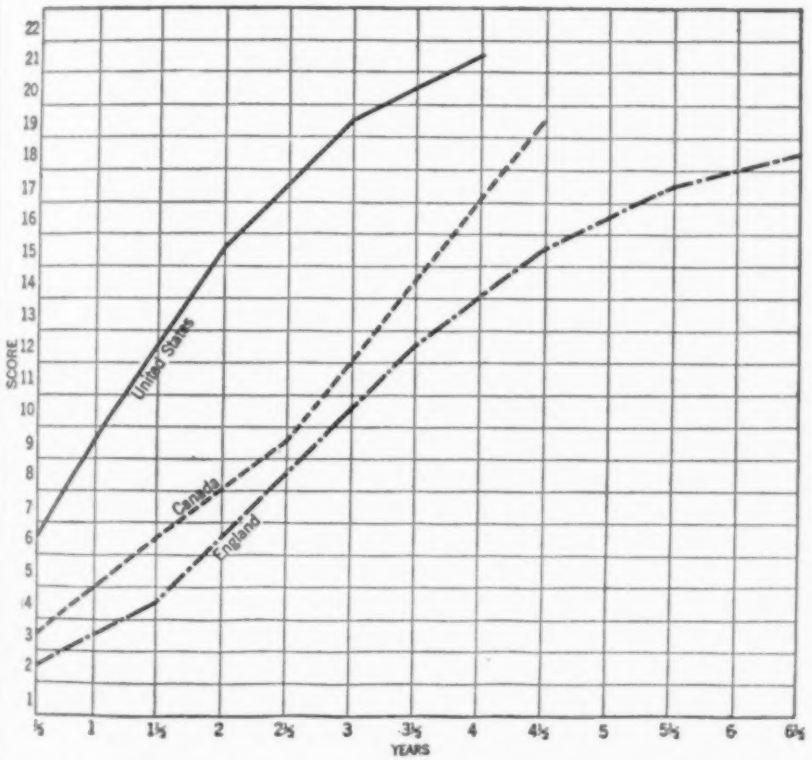

FIGURE 3. NORMS IN FRENCH SILENT READING FOR THE HIGH SCHOOLS OF CANADA, ENGLAND AND THE UNITED STATES

In contrasting the curves for the United States with those of Canada and England three factors should be borne in mind. In the first place, courses of study in the high schools of the United States almost universally require five hours a week with a normal election of four subjects. The Canadian and English high-school student normally has modern language three hours a week and carries a "split-unit" program with a greater multiplicity of subjects. In the second place, there is, perhaps, a preponderance of records from the larger high schools in the building of norms for the schools of the United States. In the third place, modern languages are almost universally in the United States elective subjects which provides an additional factor of selection.

OVERLAPPING OF DISTRIBUTIONS AND MAL-CLASSIFICATION

A second outstanding fact is the wide overlapping in the distributions from semester to semester. Roughly speaking, the upper 25 percent of those who have studied a foreign language for two semesters reach or exceed the median ability of those who have studied the language for three semesters, and the lower 25 percent do not reach the median

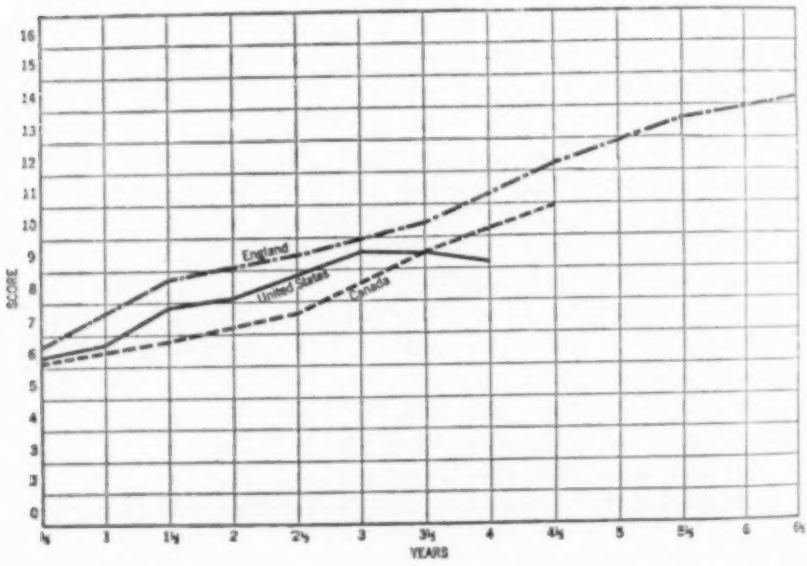

FIGURE 4. NORMS IN FRENCH COMPOSITION FOR THE HIGH SCHOOLS OF CANADA, ENGLAND AND THE UNITED STATES

of those who have studied a language for one semester. Such a lack of homogeneity cannot but make for inefficiency in instruction, and one great source of weakness becomes apparent. This overlapping of abilities holds all along the line. If the scriptural injunction, "Be ye not unequally yoked together," holds for school instruction, it applies with especial force to the modern languages. As long as we continue to measure achievement in terms of time spent in the classroom we shall have mal-classification and poorer results than we could achieve. When pupils of superior capacity and achievement are compelled to mark time, boredom and discontent inevitably follow. When pupils of inferior capacity and achievement are dragged along in lock-step fashion without real progress, discouragement and distaste arise and withdrawal follows at the first opportunity.

SCHOOL AND CLASS VARIATIONS

A third fact is the wide difference in achievement in different schools and classes. We are accustomed to wide individual differences but not to such school and class differences as the testing results show. It is easily possible to find schools which do in one semester what others take two or three to achieve. Two school systems, for example, were tested from the first to the eighth semester with the astonishing result that the differences were consistently in terms of the norms or standards set up about three semesters apart. The publication of tables showing such variations in achievements in different schools and classes in objective comparable terms will do two things: it will be a stimulus to effort and a stimulus to inquiry to discover why such amazing differences can be secured, whether it be the effect of method, curricula, teaching skill, or the native capacities of the pupils!

Consider, for example, the facts of class variability in French grammar for the fourth semester. Five classes out of 61 are below the median for two semesters, while twenty-three classes or 38 percent are below the third-semester median. On the other hand, ten classes are above the five-semester norm and four above the six-semester norm. Similar observations for the six-semester classes show that six out of fifty-three classes are well above the eighth-semester norms, while twelve are below the fourth-semester norms. The situation is similar in each of the abilities measured. Nothing can show more vividly the fallacy of measuring achievement in terms of time spent in the classroom and the need for some objective measure for the purpose of placement.

The statistical evidence shows that about 84 percent of the students who pursue a modern language at all do so for two years or less. When students present two units of a foreign language for entrance to college this may easily mean, depending upon the school from which the credits are submitted, an actual achievement corresponding to one unit in one school or to three units in another school.

The problem of placement is one that every modern language department has to wrestle with. Departments know full well that two years of a modern language in one high school is a very different matter from two years of the language in another. While this is true, it is pretty certain that no one would have suspected that the differences are as great as they are by classes and schools. The differences reported are for high schools, but it is equally true that two years of a language in one college is a very different matter from two years in another college, and class differences in colleges will be almost as great, if not as great, as in the secondary schools. The service that a standard examination can render here is obvious. The time and energy, both of students and teachers, now wasted in provisional classifications on a basis of time spent with readjustments subsequently could be and should be eliminated.

DIFFERENCES IN ACHIEVEMENT IN HIGH SCHOOL AND COLLEGE

A fourth fact is the difference in achievement in schools and colleges. Throughout the West where the accredited method of admission to college, rather than examinations, prevails, the established practice is to count a year of work in high school as equivalent to a half-year of work in college. Some institutions make this ratio three to one. The facts concerning individual and class variations indicate clearly enough that no measure of achievement on the basis of time spent in study can be valid for the individual student. A comparison of high-school and college norms, however, does have a bearing on the soundness of practices for the average student in the long run. Such a comparison of the high-school medians and college medians indicates that in the earlier levels, at least, the ratio of two to one is on the whole justified. In Table I, to facilitate the comparison, the norms in the various tests are reproduced from the tables with the norms placed to show correspondences or differences on the basis of the ratio of two to one. Thus the one semester norm for the colleges is placed under the two-semester, high-school norm, the two-semester college norm under the four-semester high-school norm and so on.

An inspection of the table indicates that the two-for-one basis of equating credits in school and college work is justified on the results of the tests for the earlier levels. The norms for each of the tests for two

TABLE I

COMPARISON OF HIGH-SCHOOL AND COLLEGE NORMS IN FRENCH, GERMAN, AND SPANISH

ITEMS	SEMESTERS							
	First	Second	Third	Fourth	Fifth	Sixth	Seventh	Eighth
FRENCH								
Vocabulary:								
High school	16	22	27	32	37	41	45	49
College	..	24	..	31	..	39	..	46
Grammar:								
High school	5	12	19	24	29	33	37	40
College	..	12	..	19	..	24	..	27
Silent Reading:								
High school	6	9	12	15	17	19	20	21
College	..	12	..	16	..	19	..	21
Composition:								
High school	5.8	5.2	7.3	7.6	8.3	9.0	9.0	8.7
College	..	7.5	..	7.9	..	8.8	..	9.1
GERMAN								
Vocabulary:								
High school	23	25	30	42	41	52	..	..
College	..	26	..	37	..	38	..	..
Grammar:								
High school	14	17	22	23	24	29	..	..
College	..	20	..	23	..	26	..	..
Silent Reading:								
High school	8	12	13	17	19	24	..	..
College	..	16	..	19	..	24	..	..
Composition:								
High school	4	4.6	5	5.2	6.1	6.3	..	..
College	..	5.7	..	6.6	..	6.8	..	..
SPANISH								
Vocabulary:								
High school	23	28	37	44	50	50	60	66
College	..	34	..	41	..	51	..	54
Grammar:								
High school	10	13	16	18	24	24	31	33
College	..	14	..	18	..	23	..	23
Silent Reading:								
High school	5	9	15	17	20	20	25	..
College	..	12	..	18	..	23	..	28

semesters in high school coincide very closely with those of one semester in college and those of four semesters in high school with two semesters in college. Thereafter the ratio breaks down. Obviously, the superiority of achievement in college is due either to the superior selection of students or to superior training, or else the postponement of the beginning of a language is indicated. The great majority of language teachers recommend an early beginning, but in equating credits we put a premium on a late beginning. These results have a bearing on, but do not solve in any way, the question of the age at which foreign-language study should begin.

CONSISTENCY OF PERFORMANCES IN DIFFERENT SCHOOLS AND VARIATIONS IN EMPHASIS ON DIFFERENT ABILITIES

A fifth fact revealed by the conversion of the test scores in the different tests into percentile ranks is the consistency of performances at different levels and the variations in emphasis on different abilities. Table II shows the consistency of performances in the Alpha French Tests for different levels of training in fifteen schools when rendered

TABLE II

PERCENTILE RANKS OF DIFFERENT SCHOOLS AND CLASSES IN THE ALPHA FRENCH TESTS

	School														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
First Semester:															
Vocabulary	67	58	50	33	50	38	52	72	39	..	64	..	..	75	..
Grammar	35	15	40	49	67	54	25	46	69	..	57	..	..	65	..
Silent reading	56	14	14	43	59	26	..	67	51	..	40	..	..	..	..
Comprehension	49	19	30	78	49	22	..	80	91	..	52	..	..	..	..
Average	58	27	35	53	56	35	38	65	63	..	53	..	..	..	..
Second Semester:															
Vocabulary	86	..	45	46	39	39	52	69	56	..	27	..	..	58	..
Grammar	70	..	40	85	43	45	31	34	60	..	33	..	..	67	..
Silent reading	81	..	12	58	53	38	44	58	55	..	29	..	..	67	..
Comprehension	65	..	48	57	41	65	48	52	61	..	84	..	..	71	..
Average	75	..	36	58	42	47	45	57	58	..	43	..	..	65	..
Third Semester:															
Vocabulary	86	..	30	75	42	23	49	58	47	36	55	48	..	50	87
Grammar	65	..	28	80	40	43	22	53	56	17	45	31	..	43	93
Silent reading	74	..	24	50	48	42	29	85	55	18	39	42	..	22	87
Comprehension	43	..	35	71	41	62	40	89	73	26	49	61	..	34	74
Average	67	..	30	69	42	43	34	71	58	24	46	42	..	39	85
Fourth Semester:															
Vocabulary	90	19	19	77	41	30	20	71	39	..	52	56	54	44	..
Grammar	78	15	10	87	48	21	7	63	53	..	47	42	63	42	..
Silent reading	82	16	6	67	43	39	12	61	42	..	37	59	44	42	..
Comprehension	70	46	13	73	41	57	12	74	81	..	75	44	64	63	..
Average	80	25	13	74	44	38	13	66	54	..	52	51	56	47	..
Fifth Semester:															
Vocabulary	87	28	17	60	32	44	..	59	70	41	55	55	..	50	98
Grammar	84	24	26	72	35	46	..	49	68	39	38	55	..	66	89
Silent reading	64	18	37	38	46	54	..	68	69	36	38	37	..	59	84
Comprehension	70	41	39	61	32	72	..	84	74	32	83	47	..	59	92
Average	76	27	30	58	35	54	..	65	70	37	52	47	..	59	90
Sixth Semester:															
Vocabulary	82	29	35	73	19	46	..	72	..	..	53	51	43	59	93
Grammar	80	24	32	82	11	51	..	51	..	..	32	42	47	77	76
Silent reading	54	7	53	39	33	54	..	55	..	..	37	40	49	63	79
Comprehension	74	26	26	53	19	70	..	59	..	..	75	43	68	44	87
Average	73	23	22	62	21	55	..	59	..	..	49	45	52	61	84
Seventh Semester:															
Vocabulary	..	45	3	72	37	46	..	63	..	42	72	75	..	50	..
Grammar	..	37	44	74	24	42	..	42	..	51	63	71	..	67	..
Silent reading	..	32	8	56	42	48	..	67	..	36	60	69	..	49	..
Comprehension	..	51	16	55	41	25	..	83	..	8	81	49	..	44	..
Average	..	41	18	64	36	53	..	64	..	36	69	66	..	52	..
Eighth Semester:															
Vocabulary	..	30	21	42	..	..	..	58	..	22	..	70	48	71	..
Grammar	..	34	35	57	..	..	..	36	..	18	..	62	53	74	..
Silent reading	..	10	17	32	..	..	..	43	..	14	..	56	52	61	..
Comprehension	..	56	61	59	..	..	..	64	..	..	..	54	74	..	..
Average	..	32	34	48	..	..	..	53	..	18	..	61	55	69	..

comparable by reduction to percentile ranks. An examination of the tables reveals in a highly interesting way how some schools are uniformly high in all of their classes while others are uniformly low. It also shows uniformities and unevennesses in the different abilities tested.

School 1 after the first semester, approximates the 75-percentile for five semesters of work, while School 2 as consistently approximates the 25-percentile position throughout the eight semesters. The pitch or level of work for each school could be estimated by taking a sample of achievement almost anywhere along the line. Not having comparable measures to determine the facts, it is likely that schools at the 25- or 30-percentile are moving along at this level without knowing it. School 5 starts at the first-semester level above the 50-percentile and drops steadily back to the 35-percentile, while School 6 starts at the 35-percentile and steadily improves its position, reaching almost the 70-percentile by the seventh semester. School 4 shows rigorous standards and improvement in its rank up to the four-semester level and then drops back. A remarkable record is made by School 15, a private school with rigorous standards of admission and obviously very high standards of work. Schools 6 and 11 made notably high standings in composition but mediocre or inferior rankings in the other abilities. School 4, which, as a part of the method used, emphasizes grammar, shows outstanding performances in grammar at all levels. School 8 emphasizes reading and gives little attention to grammar. The results of the test clearly show these variations in emphasis. These schools are known to represent contrasting and distinctive types of method and the results of the tests unmistakably reflect the differences.

CORRELATIONS BETWEEN TEST SCORES AND TEACHERS MARKS

A sixth fact shown by the correlations between test scores and teachers' marks is that marks are based almost entirely on a knowledge of grammar and not on the ability to read or write the language. The correlations between a knowledge of grammar and other linguistic abilities are high but not high enough for a knowledge of grammar to serve as an index of achievement in the language. The conclusion seems justified that grammar is stressed out of all proportion to its significance in the realization of the real objectives of foreign-language study.

PROGNOSIS TESTS

The measurement of achievement in objective comparable terms is important and desirable; the prediction of achievement is equally im-

portant and desirable. The Study has been vitally interested in the development of prognosis tests as well as achievement tests. A volume of eight studies dealing with this difficult problem is now in press. Through the fine coöperation of psychologists and educators the country over, an attempt has been made to study critically such readily available data for prediction and classification as intelligence test scores or quotients, entrance examinations, and general or specific scholarship ratings; to evaluate systematically such prognosis tests as have been developed, and to construct and validate new ones.

General intelligence or scholastic aptitude tests now so widely used are tests of verbal intelligence or linguistic ability and might therefore be expected to provide a valuable partial basis for prediction and classification. The cumulative evidence from eleven studies is that the correlations between intelligence measurements and success in the modern languages whether estimated by teachers marks or scores in objective tests fall most often between .30 and .40, a disappointingly low correlation and a very imperfect basis of prediction. While the intelligence test score may be a useful member of a team of tests, it could not be used as a basis of selection and classification or for the prediction of potential failures.

The predictive values of entrance examinations and of school marks in specific subjects or of school averages have been much studied. Out of all the mass of data, certain conclusions for the modern languages are warranted. The average of marks in the eighth grade gives a slightly higher correlation with marks in the high-school modern languages or scores in objective tests than the intelligence test. The correlations lie most often between .40 and .50. The high-school average furnishes a considerably better basis of prediction of success in the modern languages in beginning courses in college than the intelligence test. The high-school average is interestingly enough a better predictive measure than the high-school marks in the language studied when it is continued in college. The predictive value of marks in one foreign language for estimating achievement in another foreign language is below that of the high-school average. The recent study by Whitman indicates that, while the school record is generally a better basis of prediction than entrance examination, the one exception to the rule was in French. In any case, none of these readily available measures furnishes an adequate basis for prediction.

Since neither intelligence tests nor scholarship ratings provide adequate bases for prediction, attention is naturally directed to the possibilities which may lie in special aptitude or prognosis tests. Two such prognosis test batteries—the Handschin Predetermination Test and the Wilkins Prognosis Test—have been available for some years without any definite evidence as to their predictive value. Both were systematically tested out in investigations by Van Tassel, of Miami University, and Hopkins, of Colorado. The Wilkins test has a predictive efficiency represented by a coefficient of .40, slightly lower than the coefficient from an intelligence test. The Handschin test yields a somewhat higher coefficient, but it is too low for adequate prediction. The Iowa Foreign Language Aptitude Test in several investigations yields coefficients of about .50. When it is borne in mind that a coefficient of .50 indicates a forecasting efficiency only 13 percent better than a pure guess, the limitations on prediction are evident. Symonds, of Teachers College, Columbia University, has taken the best elements in earlier experiments and added new tests in two batteries which give every evidence of correlating .60 or better with subsequent achievement. These tests are now being given the final tryout and the results will be awaited with interest. Rice and Barry, at California, have developed a test which likewise gives evidence of yielding a correlation of .60.

While progress has been made in devising ways and means of predicting accomplishment in the modern foreign languages, we are not yet in a position to eliminate the trial period, wasteful though it may be, as a basis of prediction and selection. A question of interest and importance then is how well we can predict on a basis of marks or achievement-test scores at the end of a semester or of a year's subsequent achievement. The correlations between first- and second-semester achievement or first-year and second-year achievement whether measured by marks or by standard tests is approximately .75. This then represents an upper limit of prediction since we cannot expect any prognostic devices to predict achievement better than achievement predicts itself.

NEED OF EQUATING INTELLIGENCE QUOTIENTS OBTAINED FROM GROUP TESTS

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BELIEF IN EQUALITY OF INTELLIGENCE QUOTIENTS

THERE is a general belief that the intelligence quotient is a constant measure which has the same meaning for all mental tests. It has been used to express the brightness of children and it has been assumed that all tests would give individuals the same relative rating. In other words, an intelligence quotient of 120 is thought by many to have an absolute value without regard to the mental test from which it is obtained and that a pupil of this degree of brightness would be similarly characterized by any of the better tests on the market. A high school, familiar to the writer, shifted from one mental test to another and used the intelligence quotients of the two tests in the classification of pupils, and in advising them in the program of guidance, without considering the test used in obtaining the measure. A similar assumption was made in a large city system where the intelligence quotients were recorded on the permanent record card without giving the name of the test. After the results were transferred, it was practically impossible to determine whether an intelligence quotient was from a Haggerty, Miller, Otis, Terman, or any of the tests adapted to the secondary-school level.

VARIATION IN INTELLIGENCE QUOTIENT

A comparison of the intelligence quotients for an individual as measured by a number of mental tests discloses a large contrast. Miller[1] made such a comparison for ten tests and found that the mental age of an individual varied in the group of tests from 15 years and 9 months to 20 years and 4 months, and the intelligence quotients varied from 118 to 152. A large variation was also found by Miller when the comparison was made for a group of 57 pupils. The mean intelligence quotient of the group ranged from 117.5 for the Otis Self-Administering Test, Higher, to 139.0 for the Miller Mental Ability Test, Form B, as may be seen by referring to Table I. The standard deviation for this same group varied

[1] Miller, W. S. "The Variation and Significance of Intelligence Quotients Obtained from Group Tests." *Journal of Educational Psychology*, XV, (September, 1924), p. 360.

from 10.8 to 22.9. The mental characteristics of the group as measured by these two tests were markedly different.

The amount of variation can be shown further by reference to data presented later in Figure 1 and Table II. The intelligence quotients are more nearly similar at 100 than at the extremes of the distribution. It will be noted that most of the intersecting lines in Figure 1 cross at or near 100. The intelligence quotients on the different tests similar in value to 75 on the Terman Group Test of Mental Ability, Form A, are 76, 82, 68, 80, 57, 78, 66, 89, 83, and 80. Likewise, there is a large difference at the upper end of the distribution. The intelligence quotients equal in value to 140 on the Terman test are 149, 139, 161, 157, 172, 173, 148, 139, 137, and 136. An intelligence quotient of 52 obtained from one test has the same meaning as 87 on another, and the intelligence quotients 136 and 169 have the same meaning on two different tests. The equated intelligence quotients upon which these comparisons are based were taken from Table II and obtained by the standard-deviation procedure to be described in a later section of this paper.

SIGNIFICANCE OF VARIATION OF INTELLIGENCE QUOTIENT

Unless the cause of the variation in intelligence quotients obtained from different tests is clearly understood, it may tend to discredit the mental test as a measure of the capacity of pupils to do school work. Miller[2] indicates that, "On the basis of this variation some have questioned the value of group tests as a means of classification of pupils. This variation gives no grounds for the skepticism in regard to their value as instruments for classification. The variation *does* set a practical problem for users of group tests, the problem of equating the IQ's on the various tests."

The cause of the variation in intelligence quotients lies not so much in the inaccuracy of the measurement by the test, as in the selection of the group of pupils used in standardization. Each test has been standardized by a different group of pupils and consequently the norms are not comparable.

The intelligence quotients of pupils may also be affected by the extent to which the scores approach the upper limits of the mental test. Especially is this true in the upper years of the high school. The maximum mental age on the Terman test is 19 years and 6 months. Pupils with an intelligence quotient of 140 when twelve years of age cannot

[2] *Ibid.*, p. 359.

possibly have an intelligence quotient over 122 at sixteen. To have an intelligence quotient of 140 at sixteen years of age would require a mental age of 22 years and 4 months, which is not possible with norms for the Terman test. Freeman[3] has shown for various tests the different ages at which there is a decrease in the amount of gain in score with advance in age. The materials of the test are not sufficiently difficult to differentiate among the more capable pupils. Since the increase in the chronological age up to 16 years of age is considered in calculating the intelligence quotient, the intelligence quotient is lowered at the later ages for the tests for which there is not an increase in scores comparable to the increase in age.

When the same test or tests are given to all of the pupils of a school, it is not as important to make correction for the variation in intelligence quotients. If a number of tests are combined, all of the tests have affected the composite measure of brightness and the composite measures are directly comparable. When some of the pupils have been given one test and other pupils have been given another, correction is necessary for accurate utilization of the results.

Studies in guidance involving prediction of success of pupils in subjects, curricula, schools, and vocations are being made in increasing numbers. From this group of studies, there is gradually being established levels of mental capacity required for success in various types of work. In many cases, this mental capacity is stated in terms of the intelligence quotient. When utilizing the results of these studies in interpreting the intelligence quotients of individuals or of groups, it is important that the difference of intelligence quotients be considered if the pupils have been measured by a test other than that used in the investigation.

PROCEDURES FOR EQUATING INTELLIGENCE QUOTIENTS

There are several procedures which are practicable for making the correction required to place the intelligence quotients for a number of tests on a comparable basis. The two to be described here are the percentile rank and the standard-deviation score. Both of these methods locate the position of each individual in relation to the distribution. The percentile rank characterizes the individual as exceeding or being exceeded by a certain percent of the members of the group. The standard-

[3] Freeman, Frank. *Mental Tests.* (Boston: Houghton Mifflin Co., 1926) pp. 357-364.

deviation score characterizes the individual as so many units or fraction of units of standard deviation above or below the mean of the group.

Some institutions have recorded the results of various mental tests in terms of the percentile rank rather than the intelligence quotient. Doubtless, this measure defines more accurately than the raw score or the intelligence quotient the relative position of the individual in the school group. Also, it converts the raw test scores into a term which is comparable for all tests. It has certain limitations, however, which restrict its usefulness. In the first place, it is necessary that the percentile rank for different tests be calculated for the same group of pupils. Otherwise there would be the same error in the percentile rank as is being pointed out in this paper for the intelligence quotient. Secondly, the percentile rank has value only in relationship to the group from which the measure was calculated. A percentile rank of 95 in one school may have a different meaning in other schools with a more or less selected group of pupils.

As a means of equating the intelligence quotient, the percentile rank provides a procedure for converting the intelligence quotient for one test into an equivalent quotient for another. If an intelligence quotient of 110 has a percentile rank of 90 for test A and 125 has a percentile rank of 90 for test B for the same group of pupils, 125 for test B is equivalent to 110 for test A. By determining the intelligence quotients for the various tests which have equal percentile ranks, based upon the same group of pupils, it is possible to set up a table of equivalent intelligence quotients.

The method of equating intelligence quotients suggested by Miller[4] and described earlier by Woodworth[5] for combining the results of several tests, is commonly known as the standard-deviation procedure. As indicated above, the standard-deviation score characterizes the individual as so many units or fraction of units of standard deviation above or below the mean of the group. The standard-deviation score can be used as a means of recording the results of mental tests in the same way as was suggested for the percentile rank in the preceding paragraph. It has the same limitations, in this connection, as was pointed out for the percentile rank. Also, it is used in the same manner for equating intelligence quotients. Intelligence quotients obtained from different tests

[4] *Ibid.*, p. 364.

[5] Woodworth, R. S. "Combining the Results of Several Tests: A Study in Statistical Method." *Psychological Review*, XIX, (March, 1912) pp. 97-123.

given to the same group of pupils which have equal standard-deviation scores are considered to be identical and directly comparable. Those desiring a detailed discussion of the assumptions in this statistical procedure may turn to Woodworth[6] who summarizes the procedure in a foot-note to his article as follows: "It is simply assumed to be fair to compare the individual with the group average as a standard, and to measure his deviation from the standard in terms of the group variability, and, further, to compare the results so obtained in different tests."[7]

EQUIVALENT INTELLIGENCE QUOTIENTS

In an investigation made recently by the writer, it was necessary to use intelligence quotients from a large number of cities based upon most of the tests adapted to the grades of the secondary school. The intelligence quotients for all the tests were converted into the equivalent of an intelligence quotient on the Terman test. This was done by the standard-deviation procedure.

Miller[8] has reported the mean and the standard deviation of ten tests for a group of 57 pupils in the ninth grade of the University High School at the University of Minnesota. In addition, the Otis Self-Administering, Intermediate, the Otis Group Test, Advanced, and the Otis Self-Administering Test, Higher, were given to a group of 54 pupils in the ninth grade at Hutchinson, Minnesota.[9] The Otis Self-Administering, Higher, appears, also, in the list of tests reported by Miller. It was given to the Hutchinson group to provide a basis for correcting for the difference in the level (mean) and the variability (standard deviation) of the two groups of pupils. The corrected mean and the corrected standard deviation are presented for the tests given at Hutchinson in Table I with those reported by Miller. The Index of Brightness is reported also for the Otis Self-Administering Test, Higher.

Figure 1 was constructed from the data given in Table I. A standard-deviation score of 50 represents the mean of the intelligence quotients. A standard-deviation score of 60 represents one standard deviation above the mean and 40 one standard deviation below the mean. The mean intelligence quotient for the Miller Test, Form A, is 131 and the stand-

[6] *Ibid.*

[7] *Ibid.*, p. 110.

[8] Miller, W. S. "The Variation and Significance of Intelligence Quotients Obtained from Group Tests." *Journal of Educational Psychology.* XV, (September, 1924), p. 361.

[9] The writer is indebted to Mr. Ernest Hanson, principal of the high school at Hutchinson, Minnesota, for administering these tests.

ard deviation is 22.9. The line for the Miller test passes through the line for the mean, standard-deviation score of 50, at intelligence quotient 131; through the line one standard deviation above the mean, standard-

TABLE I

MEAN AND STANDARD DEVIATION OF THE INTELLIGENCE QUOTIENTS OBTAINED FROM VARIOUS TESTS*

	Mean	Standard Deviation
Army Group Intelligence Examination, Alpha, Form 8	123.3	14.7
Dearborn Group Intelligence Test, Series II C	118.1	11.3
Haggerty Intelligence Examination, Delta 2	127.8	19.0
Illinois General Intelligence Scale, Form 1	130.1	15.5
Miller Mental Ability Test, Form A	131.0	22.9
Miller Mental Ability Test, Form B	139.0	18.9
Otis Self-Administering Test of Mental Ability, Higher	117.5	10.8
Pressey Senior Classification Test, Form A	119.7	16.6
Terman Group Test of Mental Ability, Form A	117.1	13.0
Otis Self-Administering Test of Mental Ability, Intermediate	116.1	11.4
Otis Group Intelligence Scale, Advanced	121.6	10.1
Index of Brightness, Otis Self-Administering Test of Mental Ability, Higher	147.9	29.9

* The data for the first nine tests were taken from Miller.

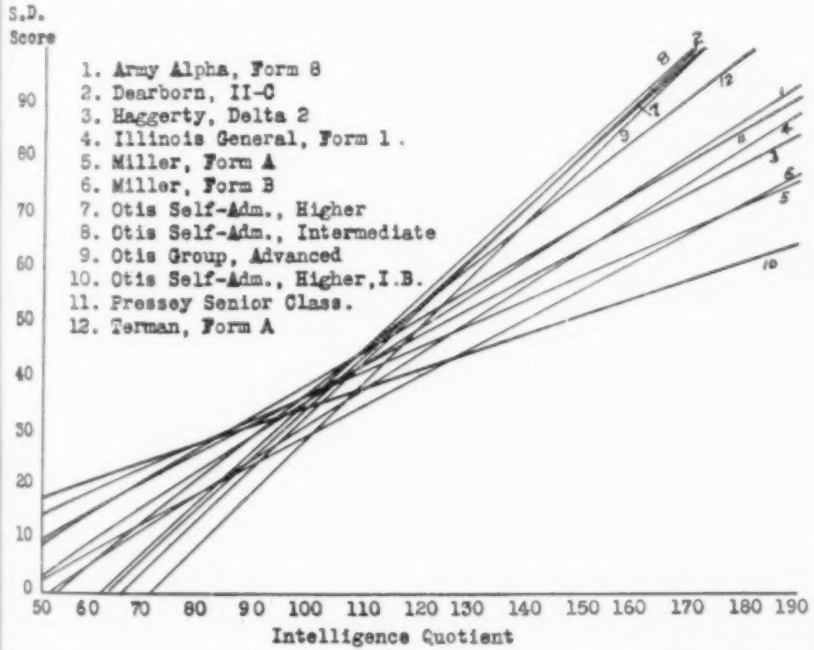

FIG. 1. STANDARD-DEVIATION CHART FOR INTELLIGENCE QUOTIENTS OF ELEVEN MENTAL TESTS

deviation score of 60, at intelligence quotient 153.9 (131 plus 22.9); and, through the line one standard deviation below the mean, standard-deviation score of 40, at intelligence quotient 108.1 (131 minus 22.9). From these three points, the line was drawn which enables one to read the standard deviation score at any point on the distribution of the test. The lines were drawn similarly for the other tests.

The equivalent intelligence quotients given in Table II were obtained from an enlarged copy of Figure 1. In each case, the intelligence quotient is equivalent to the intelligence quotient on the Terman Group test of Mental Ability, Form A. Since they were all made equal to the Terman test, they are directly comparable with each other. That is, an intelligence quotient of 120 on the Terman test is equivalent to 120 on the Otis Self-Administering, Higher, 119 on the Otis Self Administering, Intermediate, 124 on the Otis Group, Advanced, 134 on the Haggerty, Delta 2, etc.

It may be desirable to illustrate the procedure used in obtaining the comparable intelligence quotients from Figure 1. An intelligence quotient of 120 on the Terman test has a standard-deviation score of 51. The line for the standard-deviation score 51 cuts the line for the Miller test, Form A, at the intelligence-quotient line 136. Consequently, the intelligence quotient 120 on the Terman Test is considered to be equivalent to 136 on the Miller Test, Form A.

The group of pupils used to establish the basis for the equivalent intelligence quotients is somewhat selected as to level of intelligence, but the variability approximates that of a normal, unselected group. While the number of pupils may be considered to be small, the probable error involved through unrepresentative sampling does not affect the comparability of the intelligence quotients, since any variation in the mean or standard deviation through this error in sampling would similarly affect the test (Terman) with which the intelligence quotients have been made comparable, and would not modify significantly the relationship between the tests. The utmost care was used to avoid error in reading the equivalent intelligence quotients from the standard-deviation chart. The chart was drawn a second time to eliminate the possibility of error in its construction. The equivalent intelligence quotients were read from one of the charts and checked against the second. In addition, the equivalent quotients were obtained mathematically for each unit of the standard deviation above and below the mean and compared with those obtained from the chart.

TABLE II.

INTELLIGENCE QUOTIENTS FOR GROUP TESTS WHICH ARE EQUIVALENT TO THE INTELLIGENCE QUOTIENTS OBTAINED ON THE TERMAN GROUP TEST OF MENTAL ABILITY AND EQUIVALENT TO EACH OTHER

TERMAN	ARMY ALPHA	DEARBORN II C	HAGGERTY DELTA II	ILLINOIS GENERAL	MILLER A	MILLER B	PRESSEY CLASS.	OTIS GROUP ADV.	OTIS S. A. HIGHER	OTIS S. A. INTR.	I. B. OTIS S. A. HIGHER
60	59	69	45	61	31	56	46	77	70	66	17
61	60	70	47	62	33	57	48	78	71	67	19
62	61	70	48	63	34	58	49	79	72	68	22
63	62	71	50	65	36	60	50	79	72	69	24
64	63	72	51	67	38	62	52	80	73	70	26
65	65	73	52	68	39	63	53	81	74	71	28
66	66	74	54	69	41	64	54	82	75	72	30
67	67	75	55	70	43	66	56	83	76	73	33
68	68	76	56	71	44	67	57	84	76	73	35
69	69	77	58	72	46	69	59	85	77	74	38
70	70	78	60	73	48	71	60	85	78	75	40
71	71	79	62	74	50	72	61	86	79	76	42
72	72	80	64	76	52	74	62	87	80	77	45
73	73	81	65	77	54	75	64	87	81	78	47
74	75	81	66	78	56	77	65	88	82	79	49
75	76	82	68	80	57	78	66	89	83	80	51
76	77	83	69	81	59	79	67	90	83	81	54
77	78	83	70	82	61	81	69	91	84	81	56
78	79	84	71	84	62	82	70	91	85	82	58
79	81	85	73	85	64	83	71	92	86	83	60
80	82	86	74	86	65	84	73	93	87	84	62
81	83	87	76	87	67	86	74	94	88	85	64
82	84	88	78	88	69	88	75	94	88	86	67
83	85	89	79	89	71	89	76	95	89	86	69
84	86	90	80	90	73	90	77	96	90	87	71
85	87	91	81	91	75	92	78	97	91	88	74
86	88	92	83	93	77	94	80	98	92	89	76
87	89	93	84	94	79	95	81	98	93	90	79
88	90	93	86	95	80	96	82	99	93	91	81
89	91	94	87	96	82	98	84	100	94	92	84
90	93	95	89	97	84	99	85	101	95	93	86
91	94	96	90	99	85	101	87	102	96	94	88
92	95	97	92	100	87	102	88	103	97	95	91
93	96	98	93	101	89	104	89	103	97	96	93
94	97	99	95	102	90	105	90	104	98	97	95
95	98	100	96	103	92	107	92	104	99	98	97
96	99	101	98	105	94	108	93	105	100	98	99
97	100	101	99	106	95	109	94	106	101	99	101
98	102	102	101	107	97	111	95	106	101	100	104
99	103	103	102	108	99	113	97	108	102	101	107
100	104	104	103	109	101	114	98	109	103	102	109
101	105	105	105	111	103	115	99	110	104	103	111
102	106	106	107	112	104	117	100	110	105	104	114
103	107	107	108	113	106	119	101	111	106	105	116
104	109	107	109	115	108	120	103	111	107	105	118
105	110	108	111	116	109	122	104	112	107	106	120
106	111	109	112	117	111	123	105	113	108	107	123
107	112	110	114	118	113	124	107	114	109	107	125

TABLE II—(*Continued*)

Terman	Army Alpha	Dearborn H C	Haggerty Delta II	Illinois General	Miller A	Miller B	Pressey Class.	Otis Group Adv.	Otis S. A. Higher	Otis S. A. Int.	I. E. Otis S. A. Higher
108	113	111	116	119	115	126	108	115	110	108	127
109	114	111	117	121	117	127	109	116	111	109	129
110	115	112	118	122	118	129	110	116	111	110	132
111	116	113	120	123	120	130	111	117	112	111	134
112	118	114	121	124	122	132	112	118	113	112	136
113	119	115	123	125	124	134	114	119	114	113	139
114	120	116	124	126	126	135	116	120	115	114	141
115	121	117	125	127	127	136	117	120	116	115	143
116	122	117	126	128	129	137	119	121	117	116	146
117	123	118	128	130	131	139	120	122	118	116	148
118	124	119	130	131	132	140	121	122	118	117	150
119	125	120	132	132	134	141	122	123	119	118	153
120	126	121	134	133	136	143	123	124	120	119	155
121	128	122	135	135	138	144	124	125	121	120	157
122	129	123	136	136	140	146	126	126	122	120	160
123	130	123	137	137	142	147	127	126	123	121	163
124	131	124	138	138	143	149	128	127	123	122	165
125	132	125	140	139	145	151	129	128	124	123	167
126	133	126	142	140	147	152	131	128	125	124	169
127	135	127	143	142	148	153	132	129	126	125	171
128	136	128	144	143	150	155	134	130	127	126	174
129	137	129	146	144	152	157	135	131	127	127	176
130	138	129	147	145	154	158	136	132	128	128	178
131	139	130	148	146	156	160	137	132	129	128	180
132	140	131	150	148	158	161	138	133	130	129	182
133	142	132	151	149	159	163	139	133	131	130	184
134	143	133	152	150	161	165	140	134	132	131	186
135	144	134	154	151	163	166	142	135	133	132	189
136	145	135	155	152	165	167	143	136	134	133	191
137	146	136	157	153	167	168	144	137	135	133	194
138	147	137	159	154	168	169	145	137	136	134	196
139	148	138	160	156	170	171	147	138	136	135	199
140	149	139	161	157	172	173	148	139	137	136	201
141	151	139	163	158	174	175	150	140	138	137	204
142	152	140	165	159	176	176	151	141	138	138	206
143	153	141	166	161	177	177	153	142	139	139	208
144	154	142	168	162	179	178	154	142	140	139	210
145	155	143	170	164	181	180	155	143	141	140	212
146	156	144	171	165	183	181	156	144	142	141	214
147	157	145	173	166	184	183	157	144	143	142	217
148	158	145	174	167	186	184	158	145	144	143	219
149	160	146	175	168	188	186	160	146	145	144	222
150	161	147	176	170	190	188	161	147	146	144	225
151	162	148	178	171	192	189	162	147	147	145	227
152	163	149	180	172	193	190	163	148	147	146	229
153	164	150	181	173	194	191	165	149	148	147	231
154	165	151	182	174	195	192	166	150	149	148	233
155	166	151	183	175	197	194	167	151	150	149	235
156	167	152	185	177	199	196	169	152	150	150	238
157	168	153	186	178	201	197	170	152	151	151	241
158	169	154	188	179	202	199	171	153	152	152	243
159	171	155	190	180	204	201	173	154	153	153	245
160	172	156	191	181	206	202	174	154	154	154	248

SUMMARY

Contrary to the general belief concerning the comparability of intelligence quotients, there is a large difference between the intelligence quotients for an individual as obtained from different tests. This variation is greater at the extremes than at the middle of the distribution. Data were presented for an individual where the variation in intelligence quotients was as much as 24 points. The variation in the means of the intelligence-quotients for a group of pupils was 23 points.

This error can be corrected by converting the intelligence quotients into a common measure, percentile rank or standard deviation score; or, preferably, in order to retain the measures as intelligence quotients, by converting the intelligence quotients of the various tests into a test commonly used, thereby making the intelligence quotients for the various tests comparable with each other. The latter procedure was used in constructing the table of equivalent intelligence quotients which provides a basis for interpreting the intelligence quotients obtained from the different tests.

THE EFFECT OF THE QUALITY OF PENMANSHIP ON GRADES

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THE average high-school teacher detests nothing more than a poorly written paper. Such a paper may cause the teacher who does the grading to do one of three things: he may painfully struggle through the paper and decide on some kind of a grade; he may try to read a paragraph or two and then put the paper aside in disgust, giving it a very low grade; or, he may merely glance at the paper and put down a grade that he thinks the student deserves, usually a grade based on the appearance of the student, class attitude, or something else. In any case the grade may not be representative of the pupil's real ability.

Since a number of people are of the opinion that a poorly written paper does not receive the same consideration by the teacher in grading that a neatly written paper does, it is the purpose of the experiment described herein to determine as nearly as possible the effect of penmanship on grading. This method of procedure was followed: An English composition was copied in good handwriting and then in poor handwriting. These copies were passed out, at different times, to a group of teachers for grading. In each case the instructions for grading were: "Grade this paper as a composition written by an eighth-grade pupil." No further instructions were given. It is taken for granted that these papers received due consideration in grading, since the group that did the grading was made up of advanced students, most of whom were teachers.

The composition used in this experiment was selected from the Harvard-Newton Scale.[1] The composition was written by an eighth-grade pupil. The subject was, "The Good of a Lantern in Geography." The correct grade for this composition, according to the Harvard-Newton Scale, is 71.9 percent. Taking that as a fixed grade, comparisons in this experiment will be based on that figure.

Two original copies of this composition were made according to the Ayres Scale of Handwriting. One copy was made by a penmanship instructor, and this copy was rated 90 percent on the Ayres Scale. For

[1] Ballou, Frank W. "Scales for the Measurement of English Compositions." The Harvard-Newton Bulletin No. 11. Cambridge, Massachusetts: Harvard University, September, 1914.

the other original copy this plan was used: Four newsboys on the streets were asked to make a copy of the composition; from these four copies one was selected, that was nearest the rating of 30 percent on the Ayres Scale. From these original copies a hand-traced mimeograph plate was made of each. From these plates there were made several hundred copies of each original.

Copies of the good penmanship papers were passed out first to the group of 225 to grade. These 225 papers were duly graded and collected. A period of three weeks (school weeks) elapsed before the poor penmanship papers were passed out for grading. These three weeks gave those who were grading time to forget about the first papers. After the poor penmanship papers were graded and collected both sets were arranged with the scores in order, so that the standard deviation, correlation, etc., could be determined.

Six months passed and the experiment was repeated with another group of 225 graders. This time the method of collecting papers was reversed. The poor papers were passed out first for grading, and after the three weeks period had passed the good papers were passed out. As the average teacher ordinarily reads papers of varying degrees of penmanship, without any regard to order, this reverse idea in collecting was introduced to show if there was any carry-over from good penmanship papers to poor ones, or vice-versa.

In the discussion of results of this experiment reference will be made to the first papers passed out, good papers first, and poor papers second, as Group I. The second papers passed out, poor papers first, and good papers second, will be referred to as Group II.

The following Tables show in group figures the mean, standard deviation, and correlation figures on the good and poor penmanship papers of Group I and Group II. The correlation was figured in each case according to Pearson's Product Moment formula. A glance at these figures will give a general idea of the difference between the grades in each group.

TABLE I

GROUP I

	Mean	S.D.
Good penmanship papers	77.896	10.75
Poor penmanship papers	66.066	10.80
Correlation	.797 ± .0164	

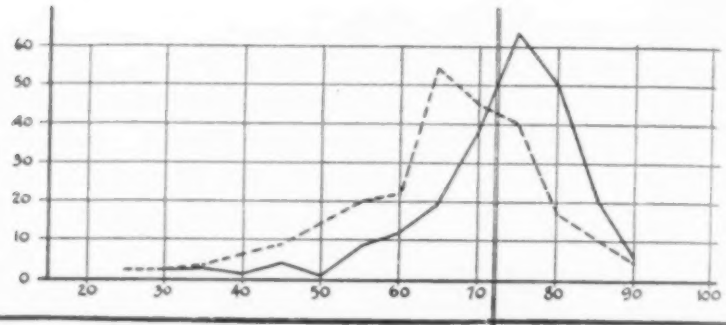
TABLE II

GROUP II

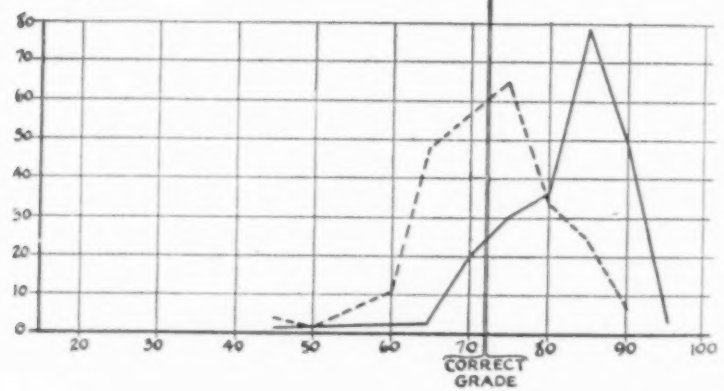
	Mean	S.D.
Poor penmanship papers	77.927	8.25
Good penmanship papers	87.949	7.10
Correlation	.918 ± .0070	

It is necessary to keep in mind the grade that the composition was supposed to rate. The correct grade, as stated before, is 71.9 percent.

Group I



Group II



Good Papers ————————

Poor Papers - - - - - - - - - - -

Base of Graph Shows Grades Given to Papers.

Vertical Side Shows Number of Papers in Each Grade Group.

Now, from Table I it is seen that there is a difference of almost 10 points (9.83) in the grades. The good papers were graded 5.991 points above the correct grade (71.9), and the poor papers were graded 3.834 points below.

From Table II the facts were collected when the papers were graded in reverse order, that is, poor papers first. Here is noted a difference of 10.022 points in the grades. In this instance the good papers were graded 16.049 points above the correct grade, and the poor papers were graded 6.027 points above.

It is to be noted also that the correlation figure in Table II is quite high; the mean of Group II is more than that of Group I. This may be due to the fact that there was some little psychological effect on the teacher when the poor papers were passed out first. Seeing a poor paper before a good one may result in this way, according to the figures of this experiment.

The graph on page 104 may show more clearly the figures given above.

MISTAKES WHICH PUPILS MAKE IN SPELLING

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FEW studies have been published which deal in any way with the mistakes in spelling that are normally made by learners of this subject. This is probably due to the difficulty encountered in determining the cause of the errors which produce these mistakes. All would, however, agree that the mistakes made in learning to spell cannot be prevented or the errors which produce these mistakes successfully overcome unless their causes are accurately determined and clearly understood by teachers of this subject.

It is the purpose of this article to indicate (1) the number and kinds of mistakes in spelling which learners of this subject normally make; (2) to explain how and why these mistakes are made; and (3) to explain how the tendencies to error which produce these mistakes may best be prevented or successfully overcome.

1. NUMBER AND KINDS OF MISTAKES WHICH PUPILS NORMALLY MAKE WHILE LEARNING TO SPELL

To determine the kinds of mistakes which learners of this subject regularly make, the following investigation was undertaken by the writers.

During the month of March, April, and May of 1926, test papers in spelling were secured from all the pupils in the Bloomington, Indiana, public schools who belonged to the 2nd, 3rd, 4th, 5th, 6th, and 8th grades,—a total of 3096 test papers in spelling or 520 papers per grade. Six hundred eight compositions were obtained from freshman and sophomore students in the high school and 1492 themes from freshman students at Indiana University. This gave a total of 5196 test papers in spelling or English Composition in which 18,840 mistakes in spelling were made.

A careful study of these mistakes was then made in order to determine, if possible, (1) the cause of each type of mistake; (2) the relative frequency with which it occurred in each school grade; (3) at what stage in the learning each type of mistake caused the most difficulty; and (4) any other facts that might be helpful to teachers in giving a type

of instruction that would enable learners of this subject to overcome the tendencies to error which produced all these mistakes.

To this end the 18,840 mistakes in spelling were grouped according to the grade in which they were made and all the misspellings for each word were assembled in order that the misspellings for each word might be compared and more thoroughly and systematically studied.

(1) Distinction between Errors and Mistakes.—It will be helpful to make a distinction between an error and a mistake. That is to say, a certain type of error regularly produces a variety of different mistakes. It was found, for example, after examining all the misspellings for each word incorrectly written that relatively few *errors* were made in producing the 18,840 mistakes in spelling made by our subjects. After grouping the misspellings for each word and studying them in the light of the studies of the disabilities in spelling made by other investigators, and after making a systematic analysis of the problem of *learning to spell* (including a study of the special difficulties and normal tendencies to error which this instance of learning naturally presents to all learners of this subject) it was found that all the mistakes made by our subjects could be grouped under 18 types of *errors. These errors represent the real causes of all the mistakes in spelling which our learners made* and are synonymous with the psychological factors that produced them. A discussion of each of these errors will be given together with certain suggestions in regard to how each type of error may best be prevented or overcome.

(2) Classes of Errors Made.—In this list of errors there are two distinct classes or types: (a) Nine of the errors were reducible to inadequate mental control over the process of writing words which our subjects clearly knew how to spell, but wrote incorrectly. Errors of this type caused 50.5 percent of the mistakes made by our subjects and they were about evenly distributed throughout the several grades, except that they were much more frequent in the second grade and were found much less frequently among college freshmen. (Compare data in Table I.)

(b) The other nine of the eighteen types of error were caused by the fact that the pupils had not observed the words correctly and so had not really learned how to spell them. Forty-nine and five-tenths percent of all the mistakes found in our test papers and themes were due to this group of causes. And the tendency to guess at the spelling of words began at the third grade and increased up to the college group. This, it will be remembered, is just the reverse of what was found for the

mistakes of expression caused by inadequate control over the process of writing the words.

(A) Cause, Prevention, and Elimination of Errors of Expression.—The relative frequency of the mistakes due to each of the eighteen types of errors made in the different school grades is shown in Table I. Each of these errors will be illustrated and briefly explained. We shall first describe the nine types of errors that produced mistakes in writing words that the pupils knew how to spell but which they often write incorrectly because of inadequate mental control over the spelling responses. Later we shall describe the mistakes caused by the fact that the words had not been adequately observed or learned.

1. Omission of a letter or letters.—Twenty and five-tenths percent of all the mistakes made were due to the omission of a letter or letters in the written words. A letter may be omitted in writing a word that the pupil knows how to spell (a) because the mind runs ahead of the hand while writing the word and so anticipates a letter further on in the word. This letter is then made because of the action of a well-known psychological law, while the omitted letter is slurred over unnoticed. If the mistake is noticed, there is as a rule a rapid reversion of attention to the letter that has been omitted; and as soon as attention is focused on this letter, it is promptly inserted *after the one* that has been anticipated and already made. This occurs through the action of a psychological law generally called the ideo-motor law, or tendency for every stimulus or idea to result in its appropriate habitual response. In the latter case we have a transposition of the two letters, a mistake that often occurs in writing with a typewriter. (See also error No. 3.)[1] (b) More often, however, the omitted letter is simply slurred over mentally and so is omitted from the writing entirely. For example, *conversation* was often spelled "co versation," also "convers tion." *Foundation* was written "fo ndation," etc. (c) Such omissions of essential letters were often caused by the fact that the initial letter of the next word to be written had the same sound as the letter omitted. For example, the phrase "advised to" was written "advise to."

2. Anticipation of letters.—Beginning at the fourth grade, there was a marked tendency for the learners to anticipate in their writing a letter which came later on in the word. Three percent of all the errors made were due to this cause, and the tendency increased irregularly as we

[1] Book W. F. *Learning to Typewrite.* (New York: Gregg Publishing Co, 1925), pp. 256-261.

passed from the second grade to the eighth. In general, the anticipated letter is repeated in its proper place in the word. For example, *conversation* was written "convertsation." The same group of psychological factors may cause a student to write a whole syllable or word twice in copying a passage or while writing a theme.

3. *Transposition* of letters in a word occurs when a letter or syllable has been anticipated in the writing and the correct letter or syllable is added afterwards. The natural procedure of attention in all cases where a letter is anticipated and made ahead of time is to revert to the letter that has been omitted and so to insert it *after* the one that was anticipated had been written. This, of course, reverses the order of the two letters. It is caused by the fact that thought is so much faster than oral spelling or the writing process and that the making of the letter follows immediately upon the pronunciation, thought, or visual image of any letter that is being mentally focused upon. Examples taken from our spelling papers are "suerly" written for *surely;* "esaily" written for easily; "fourht" for *fourth,* etc.

Seven percent of all the mistakes in spelling made by our subjects were due to this cause, and this type of mistake can only be prevented by more careful control by the learners over their spelling responses, and by the formation of the habit of testing the accuracy of all spelling responses until the correct spelling habits have become automatic. It would also be helpful to acquire the ability to recognize by inspection when each word has been correctly written.

4. *Repeating or adding a letter while spelling a word.*—A wrong letter may be added because attention becomes focused on a letter which belongs later on in the word and so is anticipated or inserted before its time, as was pointed out in describing error No. 2. In such cases the correct letter is usually inserted in the proper place later on in the word. Many errors of this type seem to be due to the habits formed in writing certain prefixes and suffixes. As soon as there is a slump in the mental processes which control the initiation and sequence of the letter-making movements, these syllable habits come in to produce this type of error in writing many words. Often there seems to be an actual mental *perseveration* of certain letters or syllables that have been previously written. This tendency produces a variety of mistakes in spelling that cannot be understood without reference to this group of psychological tendencies. The result is the repetition of a letter at various positions within the word or its insertion at the end of the word. For example,

foundation was often written "founddation"; *location* was written "locatition"; *the teeth* was written "the theeth" in a high school theme; *wisdom* was often spelled "wisdome"; *wolf* was written "wolfe," etc. etc. We found over a thousand mistakes of this sort in our spelling papers. And the extra letters in a word may be inserted at every conceivable position within the word as our group of misspellings due to this error revealed. The cause of these mistakes is clearly due to the psychological factors indicated in this paragraph.

5. *Carelessness* in making the letters accounted for six and one-half percent of the mistakes in spelling found in our papers. The more common mistakes belonging to this group of errors were due to the fact that "n" had been written for "m"; "o" for "a"; "i" for "e," etc. *Others* was written "athers"; *surely* was written "surily"; *problem* was written as "problen." This type of mistake was more common in the lower grades. Eighteen percent of the mistakes made by second grade pupils were of this sort. The mistake was made, however, at every stage of skill. More than two percent of the mistakes made by college freshmen were of this type and were caused by carelessness in writing, poor observation of the word, and by the failure of the learner to test the accuracy of his spelling responses. Better penmanship and the requirement that learners test the accuracy of their observations and written work would counteract the tendency to error which produces this type of mistake and so would prevent all mistakes due to this cause.

6. *Doubling the wrong letter.*—Only a few mistakes are made at any stage of the learning because the wrong letter in the word is doubled. However, the word *spell* was occasionally written "speel"; *freeze* as "freezze," etc. Here the learner's attention is directed to the "doubling" and is not sharply enough directed to the control of the letter-making movements. This type of error was made mostly in the lower grades but was still present among eighth-grade pupils and college freshmen, showing that the mistakes caused by this error are produced by a real psychological factor that needs to be considered and carefully controlled.

7. *Interference of associations.*—A number of mistakes were produced by the fact that the word to be written or spelled or some part of it became associated with a word that had just been written or with one further on in the sentence or list of words to be spelled. Any sequence of letters or word upon which the learner's attention becomes focused may interfere with the correct spelling of a word to be written later on. For example, in a certain spelling test, the word *soap* pre-

ceded the word *rope* in the list of words to be learned. Here the word *rope* was often written "roap" by the pupils who had been given this list of words to learn.

These associative interferences may be due either to sensory-motor elements, as illustrated by the example just given, or to ideational elements. In the latter case a certain letter or syllable in a succeeding word may be anticipated and so suggest a wrong syllable or word. For example, the word *group* was spelled "groop" because it preceded the word *troop*. In other cases the spelling of certain words was clearly influenced by the sound or meaning of the word which preceded them.

8. *Forgetting a part or all of a word and substituting another word or part of a word that sounds the same or means about the same thing.*—This mistake was very common in the second grade, but was not found in the freshman themes. For example, the word *liquor* was written for *liquid; Arthur* for *author*. Such mistakes may be caused either by the learner's forgetting the word and substituting another word of similar sound or meaning or because the learner did not hear or perceive the word correctly when pronounced by his teacher. In a few cases it was therefore difficult to decide whether a mistake should be classed here or under No. 18 below.

9. *Substitutions.*—In the second, third, and fourth grades one letter was often substituted for another in the spelling of a word. For example, *dog* was written as "dod." This mistake is doubtless caused by the fact that the letter that is substituted for the correct one has certain kinaesthetic elements that are similar to the one to be used.[2] In the example given, the learner started to make the letter "g" and finished with the "d." They both start the same way. The learner switched to the "d" probably because the making of that letter was more habitual or natural in that particular combination than the making of the "g." In any case the learner was not giving close enough attention to what was being done. A wrong word may also be substituted for the correct one for similar reasons, if the right word is forgotten or if it is not clearly apprehended and understood. For example, *lead* and *ledge* were sometimes written for *league*.

(B) Cause, Prevention, and Elimination of Errors Produced by Phonetic Spelling and Ignorance of the Word.—Half the mistakes made by our subjects in every grade above the second were due to the fact

[2] Hollingworth, Leta S. *Psychology of Special Disability in Spelling* (1918), pp. 38-59.

that these pupils were trying to write words which they had not learned how to spell. In such cases the learner tries to spell by sound. This is fatal to the learning since few words are spelled the way they are pronounced and since guessing always results in the practice of wrong spelling habits which later must be unlearned before the correct spelling habit for the word can become established.

10. Spelling by sound.—The most important error in this group is the strong and almost universal tendency to try to spell by sound. Twenty-six percent of all the errors made by our subjects were due to this tendency. For example, *Wednesday* was written "Wensday"; *scholar* was spelled "scolar"; *select* was written "celect," etc. Many mistakes were also traceable to the fact that familiar words had been combined to make a word that sounded something like the word to be spelled. For example, the word *spirit* was written "spear-ate" or "spear-it." More than a thousand mistakes of this type were made by our subjects.

11. Mispronunciation of the word.—Since so much of the spelling done by the learner is phonetic, many words are misspelled because they have been mispronounced by the teacher or because the learner, due to his colloquial speech, mispronounces them. There was a marked tendency among all the children whose spelling papers we studied to misspell words that had been incorrectly pronounced either by the teacher or by themselves. For example, the word *chimney* was very often spelled "chimley"; the word *desk* was often spelled "dest"; the word *bringing* was spelled "bringin." This type of error can only be eliminated by a more careful pronunciation of the word by the teacher and pupil, and by following the correct procedure while observing and studying the words to be learned. Almost seven percent of the mistakes found in the college freshman themes were traceable to their colloquial speech and to the tendency to spell by sound.

12. Alternatives.—Many mistakes were caused by the fact that the order of certain pairs of letters in the common words had been reversed or exchanged. For example, "ie" and "ei" in believe and receive; the suffix "tion" and "sion"; or the letters "or" and "er"; "ly" and "y"; "able" and "ible." All mistakes grouped under this error were produced because the learner had not really observed and properly fixed the correct sequence of the letters which composed the word to be spelled, and had resorted to guessing or tried to spell the word by sound. Under such circumstances the learner's past associations determine what he

will do. For example, the word *believe* was often spelled "beleive," either because of sound or because of its association with the word *receive* and vice versa. The word grammar was repeatedly spelled "grammer"; *ruler* was spelled "rular"; *lily* was spelled "liley"; the word *trolley* "trolly."

13. Using double letters for single letters.—Most mistakes of this type are clearly due to phonetic spelling and to the fact that the word has not been correctly observed and the sequence of its letters definitely fixed. Sometimes associations have been made with other words. A very common misspelling is to write the word *until* "untill." The word *Helen* was often spelled "Hellen"; the word *gas* written "gass"; the word *radish* often spelled "raddish," etc. This type of mistake occurred very frequently in the high-school and college freshman themes where it accounted for as many as eleven percent of the mistakes. This was doubtless due to the fact that many of these words had been wrongly standardized and also to the increased tendency to spell by sound.

14. Non-doubling when required.—This type of mistake is due to phonetic spelling and to the fact that the word has been associated or confused with some other word that has been improperly observed or studied. For example, the word *swim* was very often spelled with two "m's," probably because the word was incorrectly observed. The word *gallons* was often spelled "galons"; the word *wedding* was spelled "weding." This type of mistake became serious in the fourth grade and increased in frequency to the college freshman group.

15. Substituting a letter that has common visual elements for the correct one.—Mistakes of this sort are made because the word has been inaccurately observed. Bad penmanship is responsible for some of the mistakes of this type. For example, *going* was often written as "goiny." The word *store-keeper* was written "store-heeper." Only about one percent of the mistakes made by our subjects was due to this cause.

16. Homonyms.—If all words to be learned were properly studied and correctly observed and if the proper meaning of the word was regularly associated with its pronunciation and use, the fact that words having different meanings are pronounced alike, but spelled differently would produce very little difficulty. Practically, however, the mastery of these words presents a real difficulty which learners and teachers of this subject do not readily overcome. This was shown by the fact that *two percent* of all the misspellings found among 5196 subjects occurred in writing these homonymic words. That this group of words presents

special difficulties to learners of this subject is further shown by the fact that in the third grade, where words of this type are first introduced, *five percent* of all the errors made in this grade occurred while spelling this type of word. For example, the word *bare* was often written "bear"; the word *here* was spelled "hear"; the word *there* was frequently written "their."

Such mistakes are due to the fact that the words are not correctly observed and studied and that the learner fails to associate the meaning of the word with its spelling and sound. The best way to prevent this group of mistakes would therefore be to have the learners make more careful observations of the word when it is being studied and by always associating the pronunciation of the word with its meaning and correct letter sequence or form. If this procedure were insisted upon from the beginning, these homonyms would present no more difficulty to learners of this subject than the mastery of any other short and simple words. Suzzallo and Pearson,[3] for example, showed by an experiment in the Horace Mann school that it was of no real advantage to children to teach these homonyms together. Suzzallo's experiment was repeated by F. B. Knight of Montclair, New Jersey, who confirmed his results. The latter got a gain by teaching the homonyms together of only one third of one (.39) percent, while the former got a gain of only one half (.68) percent. And a later study made by W. F. Jones of the University of South Dakota showed that it actually hinders the learner if the homonyms are brought together before the second one of the pair appears in the child's vocabulary.[4]

17. Mistakes due to partial or total ignorance of the word.—Many of the misspellings in the test papers we examined showed that the learners were partially or totally ignorant of the words which they were asked to spell. In such cases the type of mistakes made clearly indicated that the pupils attempted to spell the word by sound. For example, more than fifty different wrong spellings were found for the word "superintendent." In many of these words the pupils' spelling reaction showed that they were familiar with *a part of the word,* usually the first part, had correctly observed this part of the word, and had learned how to spell or write it. For example, the word *parallel* was often written "parell"; the word *geography* was written "geogthathy." The only

[3] Suzzallo, H., and Pearson, H. C. "Comparative Experimental Teaching in Spelling." Teachers College Record 13, No. 1, 1913.

[4] Jones, W. F. *Spelling Book.* 1915.

way to successfully eliminate from the students' spelling responses this type of mistake would be by giving them more careful direction in regard to the correct method of observing the words to be learned, and having them develop the habit of never guessing at the spelling of any word which they have not learned how to spell. Mistakes of this type also call special attention to the importance of selecting and teaching words to children before they are required to use them in their written work. This would prevent all practice of errors and the standardization of wrong spelling habits.

18. *Hearing and perceiving the word incorrectly.*—About five per-cent of all the mistakes made by our subjects were due to the fact that the word which had been pronounced in the spelling test was incorrectly heard or wrongly perceived. This was very pronounced in the first four grades. Such mistakes might be due to defective hearing on the part of the learner, to bad pronunciation by the teacher, or to inattention on the part of the learner. Under such circumstances the pupil will usually write a word that sounds something like the word which he has been required to spell. Examples of mistakes produced by this type of error are the following: the word *brave* was sometimes spelled "breath"; the word *bureau* was spelled "mural." It is quite natural that a pupil who does not understand or correctly perceive a word which he is required to spell will make mistakes of this general type.

Table I shows the relative frequency in percent of each of these types of error for the different school grades. A careful inspection of this table will reveal the following significant facts:

1. That half the mistakes made in each grade were due to careless control of the spelling responses involved in writing words which the pupils clearly knew how to spell, and that the errors which produced this group of mistakes were most serious in the second grade and least troublesome for college freshmen.

2. That interference of association and mistakes due to careless control and to forgetting the word were especially troublesome in the second and third grades.

3. That the tendency to guess at the spelling of words which had not yet been learned became very strong in the third grade and increased up to the college group.

4. That one-fourth of all the mistakes which our subjects made were caused by the tendency to spell by sound. In fact, this tendency increased as we passed from the second grade, where 14 percent of all

the mistakes made were due to this cause, to the college freshman group where 37.4 percent of all the mistakes were due to this cause.

5. That mistakes due to a misapprehension of the word occurred much more frequently in the lower grades. Mistakes due to this cause were, however, still prevalent among the high-school group and the error emphasizes the importance of making the learners thoroughly familiar with the *sound* of the word by pronouncing it distinctly and by having them use it in a sentence.

TABLE I

PERCENTAGE OF SPELLING ERRORS MADE IN THE VARIOUS SCHOOL GRADES

School year	2nd	3rd	4th	5th	6th	8th	High School	Col. Fresh.	Ave. %
MISTAKES OF EXPRESSION									
1. Omission	20.90	17.70	18.90	21.50	17.0	24.2	25.8	18.0	20.50
2. Anticipation	1.90	1.70	4.00	2.70	3.0	6.6	3.4	2.8	3.27
3. Repeating or Adding Letter	7.20	6.70	8.40	8.80	6.2	6.4	9.0	5.7	7.30
4. Transposition	6.90	7.10	5.96	10.40	4.1	6.99	7.7	1.4	6.32
5. Carelessness	17.75	8.66	4.86	3.62	4.39	3.40	6.70	2.34	6.47
6. Doubling Wrong Letter	.13	.51	.43	.32	.06	.76	.26	.47	.37
7. Interferences	3.97	2.80	1.30	1.04	1.33	.57	.26	.47	1.47
8. Forgetting Word	4.64	1.53	1.10	1.29	1.85	.76	2.06	.00	1.65
9. Substitution	5.56	4.58	4.24	2.25	.81	5.48	1.55	.95	3.18
Total	68.95	51.28	49.19	51.92	38.77	55.28	56.73	32.16	50.53
WORDS NOT LEARNED									
10. Phonetic Spelling	13.64	19.13	32.66	26.21	34.68	20.98	23.45	37.44	26.02
11. Mispronunciation of Words	.40	.04	.25	.08	.92	.00	.52	6.64	1.10
12. Alternatives	.13	.51	1.05	.00	.81	1.32	1.29	4.27	1.17
13. Doubling	.66	1.74	1.41	1.29	1.73	2.65	5.67	10.90	3.26
14. Non-doubling	1.32	.34	2.71	3.78	7.75	2.27	3.61	6.16	3.49
15. Substitution of Similar Letters and Syllables	1.59	1.15	.12	.32	.75	.76	.77	.47	.74
16. Homonyms	1.59	4.92	2.52	2.65	2.60	.95	.77	1.42	2.18
17. Ignorance of Word	5.96	10.82	4.55	8.76	9.02	12.67	4.28	.47	7.08
18. Failure to Hear or Perceive Word Correctly	5.83	9.97	5.54	5.06	2.89	3.21	2.84	.00	4.42
Total	31.12	48.62	50.81	48.15	61.15	44.81	43.30	67.77	49.46

2. HOW THESE TENDENCIES TO ERROR MAY BEST BE PREVENTED AND OVERCOME

(1) How to Prevent Mistakes of Expression.—All the mistakes in expression caused by the first nine types of errors described above may be prevented by having the learners exercise better mental control over the process of initiating and controlling the sequence of the letter-making movements while spelling the words. This may be accomplished by *making the learners want to learn how to spell* and by establishing in them the habit of testing the accuracy of all their spelling responses and correcting all their written work before handing it in. This would make them notice more accurately the form of the word not only when studying it for a spelling test, but when seen in print. The latter would imprint

the correct spelling of the word more indelibly and accurately upon their minds. The correct form of the word would also be more easily and accurately recognized when correctly written.

The only way in which mistakes due to the psychological factors which produce these mistakes of expression can be overcome is for the teacher to understand their real causes and the degree of difficulty which each presents to her learners. This would enable her to take the proper steps to prevent or to overcome these mistakes if the wrong spelling of the word had become partially standardized. If these types of mistakes are not prevented or if the errors which produce them are indulged, the wrong spelling of many words will be repeated until a habit of writing them incorrectly will become so thoroughly established that the learners will not even know when the word has been incorrectly spelled.

It would take us too far afield to explain in detail how the mistakes caused by this group of errors could best be prevented or to describe the kind of direction which learners of this subject need. Suffice it to say that all words to be learned must be observed in such a way that the correct sequence of the letters in the word will be indelibly impressed upon the learner's mind so that the word can at all times be correctly written. These words must then be practiced until the correct spelling habit for the word has become thoroughly established. It should also be emphasized that the latter cannot be successfully accomplished unless the learner forms the habit of testing the accuracy of *all* his *study* and *spelling* responses and keeps up this practice until the correct spelling habit for each word to be learned has become thoroughly established.

(2) How to Prevent the Mistakes Due to Phonetic Spelling and to Ignorance of Words.—All the nine tendencies to error listed under this group of errors and the mistakes which were made as a result of these errors can be prevented by requiring the learners to make more accurate observations of the words to be learned while they are studying them, and by forming the habit of never guessing at the spelling of any word which they attempt to write. Errors in this group indicated that the original observation and study of the words and often the presentation of the word had been faulty or inadequate. This group of mistakes can, therefore, only be prevented or overcome by a re-presentation of the words and by studying them in the proper way. In this re-observation and study of the words, the more difficult words should receive special attention. A better visual analysis of the words to be learned should be made by the learner and special attention given to associating the proper

pronunciation of the word with its meaning and with its exact visual form.

The largest number of mistakes in this group were caused by the phonetic spelling of unphonetic words[5] and by the fact that the learners had failed to study the words correctly. In fact, all the mistakes caused by this second class of errors could be prevented by following the correct procedure in observing and studying the words and by forming the habit of testing the accuracy of each spelling response while the words are being studied and spelled during the learner's practices. But not only must the word be accurately observed; special attention should be given to its more difficult parts and to all the words that give the pupil most difficulty in learning. An individual list of these difficult words should be kept by each pupil for special practice and study. And since one individual may be troubled more by one type of error than by another, some individual help must be given. The latter may be accomplished in part by keeping a record of the types and numbers of errors which each learner is making. Such a record would indicate to the teacher what is causing her learners most difficulty and what is producing the type of mistakes which they are making. This information, if rightly used would enable the teacher to give the type of direction and help which her learners need.

If learners of this subject are directed from the beginning in a way that will show them how to study the words correctly and if they are required to test the accuracy of their study and spelling responses, very little individual instruction will be needed and no wrong spelling habits would need to be eliminated, for this type of direction would prevent practically all the mistakes caused by the psychological errors described in this paper.

[5] This result is in harmony with the findings of E. J. Gill who states that 57.9 percent of the mistakes in spelling made by his subjects were due to the omission or wrong insertion of silent letters. [See "The Teaching of Spelling." *The Journal of Experimental Pedagogy*, I, (1912), pp. 310-319.]

A QUANTITATIVE INVESTIGATION OF THE EFFICIENCY OF INSTRUCTION IN HIGH SCHOOL PHYSICS

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QUANTITATIVE investigations in measuring school products have become a distinctive feature of the more recent activities in the educational field. These investigations conducted in all the elementary school subjects, which now have passed the experimental stage, have turned the attention of recent research workers to the need of objective devices for the measurement of attainments in high-school subjects.

In the past, the examination system has been used as a test of the individual performance of pupils. The teachers prepared the examination questions and were the sole authority in grading the papers and assigning values. Under such a system, the teachers had no basis for the evaluation of the performance of their students as compared with the work of other students. In recent years there has been a revolt against this method of inaccurate measurement of school achievement, which has always been expressed in terms of school marks. This criticism has not been directed so much against the marking system as against improper methods of marking. In fact there has never been a system, but rather a practice which was neither systematic nor scientific.

THE PROBLEM

The purpose of this study was to determine scientifically, by means of objective data, the efficiency of instruction in physics in twenty-eight high schools in one state.

The investigation was conducted in twenty-eight high schools. These schools ranked in size from 24 to 3,500 pupils. The smallest school enrolled three pupils in physics, while the largest had an enrollment of one hundred and seventy. All of the schools included in the investigation had completed the study of Mechanics and Heat.

The principal factors under consideration were as follows: (1) to determine the extent to which the pupils in the public high schools acquired the common facts and information required in an elementary course in physics; (2) to determine what effect the size of a class had on the scores; (3) to compare the achievements of pupils in various curricula; (4) to compare the achievements of the pupils of the different

years in which physics was taught; and (5) to make a study of the relationship that existed between teachers' marks and the scores attained in the test.

Successful achievement in any subject obviously implies the acquisition of the essential facts of that subject. Although a class may have worked conscientiously for a whole year in physics, it is no proof that a year's work has been accomplished. The mere completion of a text does not imply that the subject has been mastered.

THE TEST USED

A selection of questions was made from five widely used texts in the state. The questions were based on the topics of Mechanics and Heat. This list was then sent to a number of teachers of physics for their criticism. These teachers were also requested to select other questions which they considered of greater importance than those in the original selection. Those questions which were chosen by the largest number of teachers were finally selected for the test. The test was then sent to three high schools for a preliminary trial to determine whether the questions would conform to conditions which are necessary for objective measurement.

The following is a list of the questions employed in the investigation:

TEST IN PHYSICS—MECHANICS AND HEAT

MECHANICS

M 1. What is the name of the unit of force which, acting upon one gram of mass, gives it an acceleration of one centimeter per second?

M 2. A stone dropped from a bridge strikes the water in 2 seconds; how high is the bridge?

M 3. What type of energy is represented by a bent bow?

M 4. If a force of 250 lbs. raises a safe weighing 1,000 pounds, 5 ft. from the ground, what must be the length of the shortest smooth inclined plane to accomplish it?

M 5. What law or principle states that energy can neither be created or destroyed?

M 6. To what class of lever does the wheelbarrow belong?

M 7. If the density of a piece of wood is .8, what proportion of the volume will be above water?

M 8. What is the term applied to the property which all matter possesses of resisting any attempt to start it?

M 9. Who discovered the principle of the flotation of bodies?

M 10. How many units of momentum does a 1 kilogram hammer have when moving with a velocity of 50 cm. per second?

M 11. What is the name given to the force which draws a body toward the center around which it revolves?

M 12. What peculiar property does water possess that in freezing causes iron pipes to burst?

M 13. A movable body is acted upon by two forces, one of 20 dynes due North, the other of 15 dynes due East. What will be the magnitude of the third force?

M 14. State the name of the unit which represents the ability to perform 550 ft. lbs. in a second or 33,000 ft. lbs. per min.?

M 15. The rising of oil in wicks, or the absorption of ink by a blotter is an illustration of what type of physical phenomena?

M 16. What is the term applied to that point of a body at which all the weight may be considered as concentrated?

M 17. What type of energy does a moving train represent?

M 18. What is the name of the unit which expresses the work done by a force of one gram moving through a distance of 1 cm.?

M 19. What is the value of the acceleration of gravity in C. G. S. units of a freely falling body?

M 20. What do we call the ratio which expresses the weight of a body in air divided by the weight of an equal volume of water?

M 21. How much work is done when 2 lbs. are raised through a distance of 1 yard?

M 22. What relationship holds for action and reaction between two bodies?

M 23. Who discovered the law which proves that the volume of a gas at constant temperature varies inversely as the pressure?

M 24. What is the pressure per sq. cm. at the bottom of a vessel 20 cm. high filled with mercury? (Den. 13.6)

HEAT

H 1. What is the name given in Physics to the heat taken in when ice changes to water?

H 2. How many units of heat are absorbed by one gram of ice when changing into water?

H 3. What is the descriptive name given to the amount of work units that correspond to a heat unit?

H 4. Who performed the classical experiment on the conversion of work into heat?

H 5. What Fahrenheit temperature equals (10) degrees Centigrade?

H 6. If water boiled at 232 degrees Fahrenheit instead of 212 degrees what would be the ratio between a degree on the ordinary Centigrade and a degree on this supposed Fahrenheit scale?

H 7. What is the name given to the term which designates the number of calories required to raise one gram of a substance through one degree?

H 8. State the chief method of heat transfer employed in the hot air furnace.

H 9. For what common point in heat measurement does the number minus two hundred and seventy-three (—273) stand?

H 10. How could you obtain fresh water from sea water?

H 11. In making specific heat determinations what is the name given to the amount of water which would be required to raise the Calorimeter itself through one degree Centigrade?

H 12. What is the technical name in Physics applied to the fractional increase of unit length of a rod when heated through one degree?

KEY TO QUESTIONS

MECHANICS

Question	Answer	Question	Answer
1	Dyne	10	50,000
2	64-ft. or 1960 cm.	11	Centripetal (Centrifugal not allowed)
3	Potential		
4	20 ft.	12	Expansion
5	Conservation of Energy	13	25
6	Second	14	Horse-power
7	.2	15	Capillary
8	Inertia	16	Center of Gravity
9	Archimedes	17	Kinetic

18	Gram Centimeter	22	Equal and Opposite
19	980 cm. or 981 cm.	23	Boyle
20	Specific Gravity	24	272
21	60 ft. lbs.		

HEAT

1	Heat of Fusion or Latent Heat	7	Specific Heat
2	80 or 81.4	8	Convection
3	Mechanical Equivalent of Heat or Joule	9	Absolute Zero
4	Joule	10	Distillation
5	50	11	Water Equivalent
6	1.2	12	Coefficient of Linear Expansion or Coefficient of Expansion

SCORING THE RESULTS

Table I shows the distribution of the scores made by the six hundred pupils who were tested.

TABLE I

DISTRIBUTION OF SCORES OF 600 STUDENTS

SCORE	FREQUENCY
1	—
2	—
3	—
4	—
5	2
6	2
7	3
8	5
9	3
10	7
11	10
12	9
13	22
14	15
15	28
16	17
17	16
18	26
19	25
20	26
21	34
22	38
23	44
24	41
25	39
26	31
27	36
28	31
29	26
30	22
31	13
32	17
33	10
34	2
35	—
36	—
37	—
Total	600
Median	23.2

The number and percentage of pupils succeeding in answering each question correctly are shown in Table II. The results of this table indi-

TABLE II

THE NUMBER AND PERCENTAGE OF PUPILS ANSWERING EACH QUESTION CORRECTLY

QUESTION	NO. ANSWERING CORRECTLY	PERCENTAGE CORRECT
1	387	65
2	380	63
3	433	72
4	461	76
5	264	44
6	400	66
7	407	68
8	409	68
9	543	90
10	317	52
11	206	34
12	580	96
13	286	47
14	574	95
15	360	60
16	462	77
17	461	76
18	272	45
19	301	50
20	456	76
21	561	93
22	173	28
23	504	84
24	475	79
25	92	15
26	421	70
27	516	86
28	154	25
29	308	51
30	327	54
31	273	45
32	386	64
33	378	63
34	389	65
35	495	80
36	239	36
37	448	75

TABLE III

THE PERCENTILE RANK, THE GRADE OF ABILITY AND THE CORRESPONDING SCORE OF PERCENTILE RANK OF THE 600 STUDENTS WHO WERE TESTED

DESCRIPTIVE DESIGNATION OF LEVEL ABILITY	PERCENTILE RANK	QUANTITATIVE DESIGNATION OF ABILITY	CORRESPONDING SCORES OF PERCENTILE RANK
Highest	94.5	9.0	30.9
	91.9	8.5	30.2
Very High	88.5	8.0	29.4
	84.1	7.5	28.4
High	78.8	7.0	27.8
	72.5	6.5	26.8
Medium High	66.5	6.0	25.5
	57.9	5.5	24.3
Median	50.0	5.0	23.3
	42.1	4.5	22.5
Medium Low	34.5	4.0	20.6
	27.5	3.5	18.0
Low	21.2	3.0	17.25
	15.9	2.5	15.6
Very Low	11.5	2.0	14.4
	8.1	1.5	13.3
Lowest	5.5	1.0	12.1

cate that the students have not acquired the elementary facts to a high degree and that they do not have the information that the school can give. While the questions ranged from the simple type to the more complex problem which involved several processes in its solution, this table shows that the percentage answered was lower than should be expected, assuming that these questions contain facts they should know.

Table III shows the percentile rank of the 600 pupils who took the test, the grade of ability attained by the pupils, and also the corresponding score of percentile rank.

The interpretation of Table III is as follows:

If a pupil makes a score of 27.8, his percentile rank is 78.8. This means that 78.8 percent of the pupils know less about physics at the time of the test than the pupil who scored 27.8. It also means that 21.2 percent of all the pupils who took the test know more about physics. If the pupil who scores 27.8, has a percentile rank of 78.8 we may then say that he had a physics ability of 7.0, which, according to the table, is a high ability. To illustrate further: If a pupil scores eighteen, he will have a level of ability of 3.5, which is medium low. Should the pupil score below twelve he would have an ability less than 1. It indicates also that he stands below the lowest five percent of the class. This is an indication that he has a very low degree of comprehension of the subject.

The percentile rank was obtained by using the Thorndike method.[1] The values on either side of the median (50) which are designated as the Descriptive Designation of Ability, represent an interval of $.4\sigma$. The figures in the second column which range from 1-9 are arbitrarily selected and merely represent 9 grades of ability.

SIZE OF CLASSES AND ATTAINMENT

It is frequently claimed by teachers that the size of a class affects the achievement of the students. Table IV shows the size of the classes and the class medians. These four groups represent all the schools tested in which there was only one class in physics. The first group represents the five smallest classes and groups II and III the next largest in order, and group IV the five largest classes. A study of the table shows that the variation in the sizes of the classes had no appreciable effect on the scores attained.

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[1] Thorndike, E. L. *Mental and Social Measurements.* Table 51, p. 219.

TABLE IV

SIZE OF CLASSES AND CLASS MEDIANS

	SIZE OF CLASS	CLASS MEDIANS	Q
*Group I	3	19.0	4.63
	6	16.7	4.21
	7	23.3	5.86
	8	18.3	4.61
	9	21.0	5.32
*Group II	10	19.0	4.67
	10	21.0	5.64
	14	23.1	5.81
	15	14.3	3.58
	15	21.9	5.51
	15	26.7	6.64
Group III	18	16.9	4.24
	19	20.6	5.14
	21	25.5	6.41
	22	25.8	6.45
	23	25.7	6.51
	24	18.8	4.68
Group IV	25	30.4	7.57
	28	24.0	5.89
	28	28.8	7.18
	29	16.7	4.17
	31	26.5	6.57

* The number of cases involved in Groups I and II is so small that both the measure of central tendency and deviation are of little significance.

DIFFERENCES AMONG CURRICULA

In Table V a comparison is made of the performance of the students in the various courses offered in the high schools. The reader will observe that the College Preparatory group attained a score that is more than twice that of the Mechanical group.

TABLE V

COMPARISON OF ACHIEVEMENT OF THE STUDENTS IN THE VARIOUS CURRICULA

CURRICULUM	NO. OF PUPILS	MEDIAN	Q
General	72	22.6	5.64
College Prep.	65	28.2	7.04
Mechanical	43	14.0	3.48
Normal Prep.	48	18.5	4.11

COMPARISON OF ACHIEVEMENT IN DIFFERENT YEARS

The investigation revealed the fact that physics was taught in three different years in the high school. Table VI shows the comparison of the scores attained in the second, third, and fourth years in which physics is taught.

TABLE VI

COMPARISON OF ACHIEVEMENT OF THE STUDENTS IN THE DIFFERENT YEARS

YEARS	NO. OF CASES	MEDIAN	Q
2	43	14.6	3.64
3	78	22.0	5.48
4	81	27.6	6.83

The reader will notice that the students in the second year have the lowest score while those in the fourth year have a median score of 27.6, or nearly twice that of the second-year students.

The 81 students in the fourth year were all the fourth-year students tested. The same is true of the second-year students. It appeared safe to select any three or four sections within the entire state tested, whose median score was either below that of the second year or above the score attained by the fourth-year students. These results, between the second and fourth years, are to be expected. This great difference may in part be due to the fact that the fourth-year students are more highly selected.

COMPARISON OF TEACHERS' MARKS WITH ACHIEVEMENT IN THE TEST

Schools A, B, and C, were selected because of their similarity in assigning marks. In these schools the letters A, B, C, and D, have the following designation: A-90-100; B-75-89; C-60-74; D-59 or failure. This arbitrary assignment of grades allows for no more than four classifications.

In Table VII, it will be seen that School A makes provision for not more than four grades of ability, whereas the scores in the test indicate a range from 9-30. In School B two grades are assigned, while the scores range from 14-25. The scores attained in School C do not reveal such a great range of ability, but the grades given by the teacher have no close relationship with the scores in the test. For example, pupils No. 1 and 11 rank 1.5 according to grades received, whereas their ranks are 11.5 and 9, respectively, in the performance of the test.

TABLE VII

SCHOOL A

Pupil No.	1	2	3	4	5	6	7	8	9	10	11	12	13
Teacher's Mark	80	75	80	75	95	80	70	90	80	90	90	70	95
Test Score	19	18	25	31	25	27	30	26	24	27	26	9	30

SCHOOL B

Pupil No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Teacher's Mark	75	75	70	70	70	70	75	75	75	70	70	70	70	75	70	70
Test Score	24	19	19	21	25	19	21	19	23	16	21	22	14	22	21	16

SCHOOL C

Pupil No.	1	2	3	4	5	6	7	8	9	10	11	12
Teacher's Mark	90	75	70	70	70	75	70	75	75	75	90	80
Test Score	25	33	33	30	25	31	29	29	28	28	28	32

The number of cases in Table VII are too few to justify reliable conclusions, but they show the existence of individual differences. Teachers have not indicated these existing differences by their grades, but have

shown a disposition to use a passing or medium grade which serves as a sort of safety mark for all cases of whose attainments they are in doubt.

These results indicate that many of the pupils are not properly classified, though it is quite evident that there is a considerable degree of difference among them. It furthermore emphasizes the fact that teacher's marks are notoriously inaccurate and unreliable. This fact had already been established by such studies as those made by Starch, Elliot and Finkelstein, as early as 1912. Such an investigation as the one conducted here only continues to make this fact more apparent.

SUMMARY

1. Assuming that this test calls for facts that pupils should know in an elementary course in physics, the results indicate that the pupils in the public high schools in which the investigation was conducted, have not acquired these facts.

2. The size of a class has no consistent effect on the score attained.

3. The pupils in the college preparatory curriculum attained higher scores than those in the normal preparatory, the general, and the mechanical curricula.

4. The pupils who study physics in the fourth year in high school attain the highest scores.

5. The marks assigned by the teachers and the scores attained in the test do not bear a close relationship.

AN OBJECTIVE MEASURE IN SUPERVISION

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THE record form described in this article is offered as a possible aid to supervisors of teaching. It is presented as a reinforcement of the efforts of others who are striving to make supervision objective.[1] This form may be used for recording the degree, type, and distribution of student participation in the classroom. A straight line represents a pupil; the direction of each line indicates the direction in which the respective pupil is facing. The code for expressing different types of responses is explained in one of the sample forms (Figure I). The symbols were chosen for the speed and ease with which they might be written; for their legibility (when formed hastily, each is sufficiently unique to be easily differentiated from the others); and where practical, for their connotation ("V" stands for voluntary; "h" for hand, and so on).

The code as a whole may be thought of as differentiating between two major types of responses: voluntary and forced. The latter term is used to describe those instances in which the teacher calls upon a pupil who has not raised his hand. The basic symbol for this is a dash, "–". "Voluntary participation" is the name given to those instances in which the student volunteers a response, either raising his hand and being called on or responding spontaneously without raising the hand first. The foundation symbol for this is the letter "V." From these basic symbols it is possible to build a code to represent more detailed differences of response: "–B" to express a forced participation in board work; "V!" to express a voluntary question asked by a pupil.

In a class by themselves are the "Cp", "Ct", and "Cpp". The first two represent teacher-pupil conferences; initiated by the pupil ("Cp"), or by the teacher ("Ct"). An example of the teacher-pupil conference

[1] Barr, A. S. "Some Problems Ahead in the Scientific Study of Classroom Supervision." *Journal of Educational Method*, VII, (Nov., 1927), pp. 64-70;
Barr, A. S. "An Evaluation of Items to Observe in Classroom Supervision." *Journal of Educational Research*, XVIII, (June, 1928), pp. 53-65;
Knight, F. B. "Possibilities of Objective Technique in Supervision." *Journal of Educational Research*, XVI, (June, 1927), pp. 1-15.
Morrison, Henry. *The Practice of Teaching in the Secondary School*. (Chicago: University of Chicago Press, 1926), Chaps. VIII, IX;
Puckett, Roswell C. "Making Supervision Objective." *School Review*, XXXVI, (March, 1928), pp. 209-212.

initiated by the pupil is a situation in which the pupil calls the teacher to his desk for individual help. The last, the "Cpp", represents a pupil-pupil conference.

SUGGESTIONS IN THE TECHNIQUE OF RECORDING

Actual use of the record has shown that accuracy is not obtained on the first trial. For the supervisor of teaching who is in the habit of following the thought of the class work, several trials are needed to establish the habit of concentrating only on the mechanical aspects of participation to determine the amount, type, and distribution. Even by the end of a series of 15 class hours in which student responses were recorded, the investigator found that for an accurate record, full attention needed to be focused on this one aspect of the class work.

Certain points aid in record keeping. First, it is a help to obtain a seating list before class, in order to have the lines representing the spatial arrangement of the class drawn and named before the activities commence. The naming of the lines is an important point. The observer then has the aid of ears as well as eyes for locating the participating pupils.

Second, if the observer can, without making the pupils conscious of his presence, sit in a position from which he can see at least the profiles of the pupils, the location of the individual who, at any given moment, is participating is greatly facilitated. Also it is an aid in determining whether or not the participating pupil raised his hand. It is impossible, in using this form, to record all the individual hand raisings of pupils who are not called on. It is recognized that in this respect the final class picture is incomplete. Possibly, after long practice with the form, this might be included; or, possibly an assistant might work with the observer to record this one item, if this factor seemed necessary to obtain a record adequate for the purpose of the individual supervisor.

Third, the devising of formulas for use by the observer seems to be necessary for an instantaneous classification of the ever-changing classroom situation: *e.g.*, "Was he forced to participate? If so, the basic code is '–'. If not, basic code is 'V' "; or, "Was that a question for seeking information? If so, the code is 'V?'. If a rhetorical question, the code is 'V' " (the same as for any voluntary contribution.)

Fourth, in order to maintain consistency in the classification of activities it seems necessary to define a participation as a response "bounded" by the participation of one or more people. According to such a definition, each of a series of 3 short responses of one pupil to 3 consecutive

questions by the teacher would appear in the record as a response. In order not to overrate a situation in which, for instance, it was necessary for the teacher to ask three questions of a pupil in order to draw out a satisfactory response, one may group the 3 minor participations in one bracket. In the after-class study of the record, a more accurate final rating may then be given. Without this arbitrary and limiting definition of what is a participation, two different observers will vary considerably in the number of responses credited to individual pupils. The same use of a bracket in the group responses refines that record to a greater degree of accuracy.

POSSIBLE USES OF THE FORM

A study of sample records shows the form to be of use in the following ways:

I. As a *picture of the physical aspects of the class* in respect to the spacial relation between pupil and pupil, and pupil and teacher. From these records the supervisor can instantly read the degree of socialization of the different classes as expressed in seating arrangement. He may determine from them whether this physical aspect of the class facilitates or handicaps the realization of the course aims.

II. As a *measure of the amount* of student participation in the class as a whole. Here the supervisor may, for example, compare the average number of 45 student participations in a class of 15 in Latin, Sec. I with an average of 106 student participations for the same sized class in Latin, Sec. II. Such records reveal at a glance that a totally different mental environment exists in the two classes. The educational director may then study the situation in detail to determine which is more favorable to mental growth.

III. As a *record of the types* of participation. One may read directly from the record whether or not the class visited were of the question-answer type as indicated by a long series of forced responses ("–") almost uninterrupted during a period of fifty-five minutes by a voluntary response ("V"); or whether there was a conspicuous degree of independent mental activity as revealed by numerous and widely distributed voluntary contributions ("V"); or an aggressive effort on the part of the pupils to learn the subject material as indicated by frequent voluntary questions ("V?") and by pupil-teacher conferences initiated by the pupil ("Cp"); or whether, in contrast to a situation dominated by a teacher who is a social or intellectual tyrant, there is a situation of social and mental freedom as expressed by a conspicuous

number of voluntary contributions without raising the hand ("V"), voluntary questions without raising the hand ("V?"), voluntary physical movement to the board or map without raising the hand ("VB", or "V" with any other appropriate symbol attached.)

IV. As a *picture of the distribution* of student participation. Whereas a class as a whole might rate high in participation in the mind of the supervisor from unrecorded observation, an objective record of individual response might disclose the fact that about two-thirds of the participation came from one-third of the class. (Figure I)

Furthermore, one may read from the chart the distribution of different types of responses. For instance, if the instructor were striving to stimulate spontaneous expression he could learn from the position and number of "V"s on the record with which individual pupils and to what extent he were succeeding.

V. Besides the number, type, and distribution of individual responses, one may read from the record the *frequency and type of group responses.* The interpretation of the record of individual responses should, of course, be made only after considering the amount and kind of group participation. A class record low in individual response probably would not be as unsatisfactory if it contained numerous group responses, each representing an opportunity for every pupil to take part.

The record of group work contributes not only to the picture of mental activity of the class but also to that of the social activity. Group responses usually would lead to a degree of group consciousness not attained by purely individual work.

VI. As an aid in *personality studies of individual pupils.* A comparison of James's record (Figure I) with that of Sue suggests the aid that such records can be to the teacher who wishes to get acquainted with the personalities in her class. Records obtained periodically throughout the year would indicate the development in mental and social expression of individual pupils.

These records also could contribute to intensive individual studies. For instance, a week's observation in classes of Arthur Mann at the time he was recognized as a problem-student might show the following to be typical of his response in class.

	Latin	Algebra	History	English
Typical Records for Week of Oct. 1-5	– –	–)	– –	– –
	–	–)		
		–B		–
	– –			

After two months of special work with Arthur through a program agreed upon by all his teachers, the changed situation might be revealed by the record given below:

	Latin	Algebra	History	English
Typical Records for Arthur Mann for Week of Dec. 11-15	–	–	V	–
	–B	Vh	–	–
	–	–	V	V
	V fh	VBh	V	Vh
	–	–	Vh	–
		–	–	V
			V f	V

The difference in response is obvious. The report of a change in Arthur would not be based on vague impressions but on an objective record which in some cases might advantageously be shown to the pupil.

VII. As an aid in a *study of methods in different subjects.* A series of records of this type taken in classes of different subjects would show the average amount, kind, and distribution of participation in the respective courses. On the basis of this, one might profitably consider whether or not the degree of similarity or difference be advantageous to the realization of the aims in each respective course.

VIII. As an objective record of the *type and quality of a teacher's work.* A comparison of Figures I and II shows that it is possible to get from an inspection of these records an immediate conception of the general type of classroom environment created by different teachers. Figure I represents an informal situation; whereas Figure II pictures a distinctly more formal atmosphere. In both cases certain individual pupils are below the average in response. Such concrete records as these furnish the supervisor with clear detailed pictures of the participation phase of different classes. A series of such class reports collected at intervals throughout the year would give the supervisor an objective measure of the trend and progress of this phase of a teacher's work. A joint consideration of these by the supervisor and instructor might be especially valuable in guiding the new teacher.

IX. As an objective measure of the *effectiveness of the supervisor's teaching at faculty meetings.* If, for example, the educational director has carried out a series of five carefully planned meetings on the value of student participation in learning, and finds at the end of the series that class records indicate no improvement along this line, he may feel that something further be needed in his presentation.

FIGURE I

STUDENT PARTICIPATION

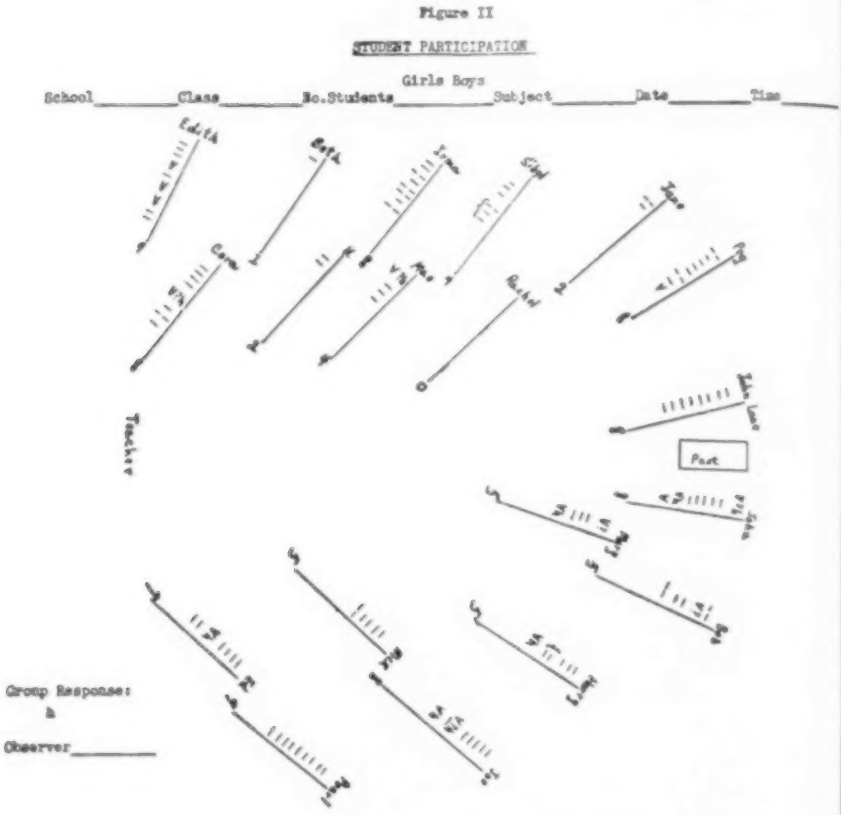
School..... Class..... No. Students Boys Girls..... Subject..... Date..... Time.....

–	called on and responded—verbally or otherwise (without hand raised)
– –	called on and gave no response or said, "I don't know."
–B	called on (without hand raised) for board work and responded with board work
–B–	called on for board work and gave no response
h	hand raised—not called on
V	voluntary contribution—verbal or otherwise (without hand raised)
Vh	volunteered to participate by raising hand and was called on
VB	voluntarily went to board (without hand raised)
VBh	voluntarily went to board (with hand raised)
V ?	voluntarily asked question (without hand raised)
V ?h	voluntarily asked question (with hand raised)
|	group called on and they responded—verbally
h	group called on and they responded—with hands
V	voluntary participation of group—verbal or otherwise (without hands raised)
Cp	teacher-pupil conference (initiated by pupil)
Ct	teacher-pupil conference (initiated by teacher)
Cpp	pupil-pupil conference

When group is engaged in individual work, such as writing a quiz, this fact, with the amount of time given to the activity, should be stated in a note under "group responses."

Note: The code may be omitted from the record sheet as soon as it no longer is needed for reference during record taking.

Figure II



SUMMARY

The record form as given in Figures I and II is offered as a possible aid in the supervision of teaching. It is presented not as the sole form to be used but as one of several different devices which any director would need for objective records—this tool to be used in observing one particular phase of teaching. Trial uses of the form have shown it to give, at a glance, a picture of the amount, type, and distribution of student participation in the classroom.

THE VOCABULARY CONTENT OF COMPOSITIONS WRITTEN BY COLLEGE STUDENTS

PAUL A. WITTY AND MABEL FRY
University of Kansas

THAT the written compositions of high-school students are characterized by a general lack of clear, forceful, and precise expression has been shown by several studies. OBrien points out that emphasis, precision, and style are conspicuously lacking in the written work of high-school students. He attributes this lack to the attempt of the students to communicate thought without an adequate command of the verbal instruments needed.[1]

Although several studies have revealed the prevailing dearth of vocabulary in high-school students, few have dealt with the vocabulary development of college students.

The following study seeks: (1) to determine the vocabulary employed by typical freshmen and upper-classmen in written work, and (2) to compare this vocabulary with the vocabulary manifested by the same students in reading.

DATA AND PROCEDURE

Data were secured during the second semester, 1926, from five classes of upperclassmen and five classes of freshmen enrolled in the School of Education and the College of Liberal Arts of the University of Kansas.

The vocabulary employed in writing was determined by analyses of the compositions of representative students. The students were instructed to discuss the actual characteristics of their best liked teachers, writing for twenty-five minutes. There was no suggestion given at any time that the compositions were to be utilized in a vocabulary study.

The Inglis Test of English Vocabulary, Form A, was employed to test the student's reading vocabulary or, more specifically, his ability to recognize words.[2] A total of 340 compositions and a like number of vocabulary tests were obtained, distributed according to class as follows:

CLASSES	NUMBER OF PAPERS
Freshman	170
Junior and Senior	170
Total	340

[1] OBrien, F. P. "The Vocabulary of High-School Students in Written Composition." *Journal of Education Research*, XI, (May, 1925), pp. 344-350.

[2] Inglis, Alexander. *The Inglis Tests of English Vocabulary, Form A.* Manual of Directions. Chicago, Illinois: Ginn and Company.

The Thorndike *Teachers Word Book* was utilized to determine the vocabulary content of the compositions.[3]

Every word in every composition was classified according to its index number in the Thorndike list. Data were assembled for the freshmen and upperclassmen separately. The scores upon the Inglis test too were treated separately for the two groups. The relative development of the groups in regard to these two types of vocabulary was then ascertained. To determine the extent to which college students employ in writing the words they readily recognize, the results of the Inglis test were correlated with the data secured by analysis of the vocabulary content of the students' compositions.

RESULTS AND COMPARISONS

Table I displays the percentages of words employed by the two groups in their compositions assembled according to their index numbers in the Thorndike list.

TABLE I

CLASSIFICATION OF WORDS ACCORDING TO THORNDIKE WORD LIST

	FRESHMEN	JUNIORS	SENIORS	JUNIORS, SENIORS, OR UPPER CLASSMEN
Median percentage of words used in the compositions that are in the first thousand of the Thorndike list	85.35	84.50	84.30	84.43
Second thousand	5.47	6.28	5.81	6.09
Third thousand	3.44	3.59	4.06	3.61
Fourth thousand	1.70	1.78	2.12	1.98
From 4001 to 5144	1.77	1.42	1.78	1.87
From 5145 to 10,000	0	0	0	0
Not included in Thorndike list	2.51	1.82	1.70	1.88

It is of interest that the upperclassmen depend for expression upon practically the same words as do the freshmen. There has been apparently little growth in the upperclassmen in this regard during their college course. Nor is there appreciable superiority for either of these groups over the standing of representative high-school pupils. Eighty-eight percent of the words used by certain high-school seniors studied by OBrien are among the first 1000 of the Thorndike list. Eighty-five percent of the words employed by the university freshmen studied by the present writers occur in the same category. It is surprising and significant that university upperclassmen depend for written expression upon

[3] Thorndike, Edward L. *The Teachers Word Book*. New York: Teachers College, Columbia University, 1921. *The Teachers Word Book* contains the 10,000 most frequently appearing words identified by actual count of 4,500,000 words assembled from 41 sources. An index number is assigned to each word indicating its frequency position. The first 1000 words include the extremely common words, the last 1000 words much less frequently used.

approximately *the same stock of common words as do the freshmen and exceed high-school seniors only slightly in this regard.*

To measure the relationship between recognition of words and word usage in written composition, the scores upon the Inglis Vocabulary Test were correlated with a number of the unusual words employed by the students in their compositions. Unusual words were considered to be those words not occurring in the Thorndike list. The number of such words used by each student was ascertained and compared with the score made by the student on the Inglis test. The product-moment formula for calculating the coefficient of correlation was employed in estimating this correspondence. The following results were secured:

Freshmen	$r = +.18,\ P/E = \pm.04$
Upperclassmen	$r = +.25,\ P/E = \pm.04$

The writers realize that the number of words not in the Thorndike list may be an invalid measure of the student's ability to express himself with precision and accuracy. However, an examination of the words which were not included in the list convinced the writers that these words were in general unusual words which facilitated clear, easy, forceful expression.

The coefficients of correlation given above were corroborated in the following manner. Order of merit ranks were assigned the students according to the number of words used by them which had index numbers beyond the first 1000 of the Thorndike list. These ranks were correlated with the order of merit ranks secured from the Inglis test. The following r's were obtained.

Freshmen	$r = +.206$
Upperclassmen	$r = +.22$

The r's indicate a conspicuous lack of agreement between the ability to recognize words and the habit or practice of using these words in written composition. These data suggest that the development of the college student's reading vocabulary is far more satisfactory than the development of his active writing vocabulary.

It is of interest that the scores made by the groups correspond fairly closely with the standards given by Inglis. The freshmen defined 66.08 percent of the words in the Inglis test correctly while the median for the upperclassmen was 71.5. The norm or standard given by the author of the test is 70 for college freshmen and 86 for college graduates.

The median number of words written by each group in the 25 minute period was ascertained. The median for the freshmen was 231.07, for the upperclassmen 277.77.

The freshmen show a superiority in the number of words written in the time allotted when compared with the high-school pupils studied by OBrien. His investigation shows a median of 125 words written in 25 minutes. It must be kept in mind, however, that the OBrien study was made in the smaller school systems of Kansas and does not reveal the actual status of certain progressive high schools in larger cities.

A comparison of the median for the length of upperclassmen compositions with that for the freshmen compositions shows a difference of 46.7 words in favor of the upperclassmen. Apparently the upperclassmen are more fluent in the writing of compositions than are the freshmen.

SUMMARY

The vocabulary employed by university freshmen and upperclassmen in composition writing was studied. An appalling paucity of expression was manifested by both groups. Eighty-five percent of the words written in 25 minutes by the freshmen were found to fall in the first 1000 of the *Thorndike Word Book* while 84 percent of the words used by the upperclassmen occurred in this category. It is interesting that little growth in this regard is indicated during the college course. This finding suggests needed change in emphasis in English courses.

The relationship between recognition of words and the tendency to use these words in written compositions was studied. The results of the Inglis Vocabulary Test were correlated with the number of unusual words used by the students. The r's were +.18 and +.25 for the freshmen and the upperclassmen respectively. The r's indicate a conspicuous lack of the agreement between the ability to recognize words and the tendency to use the words in written work. The teacher of English must not expect training in word recognition to transfer to a large degree to word usage in composition writing.

The median number of words written in the 25 minute period was 231.07 for the freshmen and 277.77 for the upperclassmen. The upperclassmen appear therefore to exhibit considerably greater fluency than do the freshmen. They depend, however, upon the same stock of commonly used words and exhibit little beauty, force or precision in written expression.

EDITORIALS

THE SCHOLARLY STUDY OF COLLEGE EDUCATION

One need be only mildly sensitive to current trends in education to be aware of unwonted activity at the college level. The tangible reflection of this activity is the rapidly accumulating body of literature bearing upon college problems. A recent examination of publications in this field reveals an astonishing list of titles exceeding several thousand. Probably two thousand have been published within the decade 1918-1928 inclusive. This literature is widely scattered, appearing through more than a hundred avenues of publication. Some is in books, but by far the larger portion has come forth as monographs, bulletins, and articles in professional and literary periodicals. A summary of 1162 titles which the writer has had occasion to examine recently amounts to more than 14,000,000 words, or the equivalent of considerably more than 100 sizable volumes.

A little while ago most studies in the field of college and higher education were made by agencies outside the institution in which the study was carried through. The United States Bureau of Education, the national organizations of professional groups, educational and philanthropic foundations, and similar bodies have investigated from time to time a wide variety of college problems. In these studies made by extramural agencies the problems of organization and administration bulk large. More recently colleges and universities have undertaken the study of their own problems, and individual members of faculties within institutions have published articles, delivered papers, and written books bearing upon one or another phase of higher education. Of particular significance is the fact that a number of institutions have undertaken investigations as institutional enterprises through administrative officers, bureaus, committees, or other local agencies. In the literature thus produced more than 125 institutions are represented, either by studies on the part of individuals or as institutional enterprises. In a half dozen colleges and universities the business of studying and publishing investigations of local problems has become a continuing process. A number of

such institutions list ten to twenty-five titles each, and in one case the number amounts to more than sixty.

More significant than the increase in quantity of published material bearing upon the college problem is the increasing effort to introduce into college discussion the experimental method. The dialectical analysis of educational concepts, citations from personal experiences, the strenuous defense, often made with extreme cleverness, of traditional educational theories—all are gradually being forced to stand aside while serious students of education insist on subjecting theories to the acid test of verifiable information. It is easily charged, and must be admitted, that initial effort to apply experimental techniques to the intricate problems of human affairs is often a lame and halting procedure, and far too much may easily be claimed by way of fact and inference as forthcoming from first efforts in this direction. Incontrovertible, however, is the evidence that college administrators are in desperate need of even the meager information which our studies can easily reveal, and there is growing evidence that students of college education will force the issue at an ever accelerating rate. There is no denial of an evident determination to study education as well as to practice it and to standardize its forms, procedures, and the institutions which carry it forward.

One's enthusiasm concerning progress in the field depends largely on the point of view which temporarily possesses him. Let him envisage the whole problem of higher education and all the antecedent and prerequisite activities related thereto, let him realize how intricate are all of the genuine and real problems of the evolution and education of youth into mature and efficient men and women, and he may well be depressed by the little margin of the educational program which has thus far yielded itself to scholarly methods of investigation. Let him, on the other hand, reflect upon the inroads which methods of educational study within a decade and a half have made upon traditional practices in the field of college education, and he may well thrill at the prospect which the progress already made foreshadows. Sanity, of course, demands that the individual must, at least alternately, and to the degree possible, maintain both of these points of view. He may not be too thrilled with the little progress which has been made, nor should he be hopeless about the possibilities of further pressing back the borderlines of educational ignorance. In so far as the steadily accelerating rate of publication of serious and scholarly studies of college education can be a criterion, there is distinct ground for hope. When a somewhat heated debate may now

be halted by the simple query, "What are the facts in this matter?" or, "Have we any factual ground for judgment?" we may well take heart in the belief that we have moved forward.

Let one become sensitive to the myriad unsolved problems in the field of college education—problems of student character, ability, student interest and emotional set; problems in the manifold curricula now offered to adolescent youth; problems of instruction; problems of organization and administration—let him see the complex intra-mural and extra-mural world in which boys and girls are fighting their way to maturity and effective living, a world fairly reeking with a thousand ignorances that may be subjected to critical and even experimental analysis—let him at the same time become familiar with the new developments in the field of educational investigation—experimental, statistical, documentary, and otherwise—and he may well envisage a future for the study of higher education that is one of great promise. For its development and for the prosecution of the innumerable studies already on the margin of possibility, one needs severe and thorough training, unfailing industry, the capacity for coöperation with many other persons interested in like matters, a stout heart, and an imaginative mind. For young men of this type who will resolutely set their faces to the future, there is a distinct promise of happy usefulness in scholarly study of college education. M. E. H.

THE CURRICULUM AND THE FUTURE

Friendly critics of the job analysis techniques used in curriculum construction assert that the instructor may, by their use, teach the best practices of today but that such a procedure will leave the student helpless to meet the problems of tomorrow. This criticism brings to the front the question of how any curriculum taught in this generation can prepare the student to meet the changed conditions which will arise in the next generation.

Obviously, of course, no curriculum of today can teach methods of individual and social control which are unknown today. In 1885 it was not possible to teach boys how to drive automobiles and guide airplanes nor to construct radio sets and play basketball. However, the application of two simple pedagogical principles will do much to prepare the student while he is in school to meet the novel problems with which he will be faced in adult life.

In the first place, it is possible and desirable for teachers to present to the student the best solutions for the problems of today. In certain fields we can locate these best methods by consensus of expert judgment as in the social sciences where expert judgment is usually the final test of value. Judgments so derived are not comfortably valid and reliable; but they are the best that can be secured and therefore must be used. We can in quantitative fields secure more objective judgments in which we can ascertain the best methods of acting with great accuracy. In every case the principles upon which these methods are based are wisely introduced because principles change with less rapidity than the situations to which they may apply. But whether we use judgment or measurement as our criteria for evaluation, it is possible for teachers to give to the student what they sincerely believe to be the best known solutions for present-day problems.

If, to the objective of providing best known solutions is added the principle of teaching the student to think his way through these solutions, the future is still better cared for.

It is possible to present best methods to the student through exposition and to require him merely to memorize the solution. In that case, the student is helpless in the presence of new problems because the solution he has memorized will not fit. If, however, in connection with today's problems the student is taught to use his intelligence in acquiring the solution, he has gained not only a knowledge of the best solution but the technique of thinking problems through for himself. He has learned to mull material, to weigh suggestions, to apply principles, to arrive at solutions, and to verify them.

Thus armed with the best-known practices and the polished techniques of thinking, a student is fortunately placed in meeting the future. When new situations arise he can face them with a reasonable degree of confidence. So trained the student actually may reach better solutions than the teacher could provide on such future occasions if he were present. If we give the student such a course of instruction, we need not worry about the future. In any case, we have done all that can be done.

W. W. C.

REVIEWS

Address all communications relative to book reviews to Editor E. J. Ashbaugh, Ohio State University, Columbus, Ohio.

GREENE, H. A. *Work-Book in Educational Measurements.* Longmans, Green and Company, 1928. iv + 155 pp.

Dr. Greene has devised this book for the use of students as a supplement to the textbook *The Use and Interpretation of Educational Tests* by Greene and Jorgensen. Each new step is explained; key questions asked, the answers to which are to be written out and handed to the instructor; and practice material in ample quantity provided for the working of problems involving the type of difficulty under consideration. The central idea seems to be that even college students learn to do by doing and profit most when they demonstrate each successive step in a concrete way.

BUCKINGHAM, B. R. AND OSBURN, W. J. *Work-Book for Grade VI* (to accompany the Buckingham-Osburn Searchlight Arithmetics, Book Three, Part II). Ginn and Company, 1928. 110 pp.

No series of textbooks in arithmetic these days (as well as in many other subjects) is complete without a workbook. This series is well fortified in this respect. To a large extent the purpose seems to be two-fold: to explain so thoroughly that the child does not need any explanation on the part of the teacher, and to furnish a large amount of practice material for the application of principles explained. A number of progress tests are included in the back of the book which the teacher is expected to remove and to furnish to the pupil as he completes the work unit by unit.

STAECH, DANIEL, AND MERICK, GEORGE A. *The Test and Study Speller.* Silver, Burdett & Company, 1928.

This is a revision of the first issue under this title which appeared in 1921. Apparently the revision is characterized by the following things: (1) The authors are much less specific regarding the source of vocabulary in the revised edition than in their original edition. (2) The same emphasis on testing appears with perhaps a slightly greater emphasis on tests with percentage values given. (3) There has been a diminution in the number of words grouped around certain common experiences and activities.

The total number of words remains practically the same and the word building follows the same general lines.

HARRIS, MARY LOUISE. *Exercises and Tests on English Classics.* Ginn and Company, 1928. 269 pp.

Most of our workbooks in English have been concerned with the formal side of spelling, punctuation, capitalization, etc. Here we have a pad covering work in Ivanhoe, Treasure Island, Julius Caesar, Merchant of Venice, Lady of the Lake, and the Odyssey, together with a similar set-up on the short story. The work is set forth on the Dalton Contract basis, with a frank statement to the students that the accomplishment of satisfactory work in Contract D gives a grade

of D only, and that higher grades must be earned through the completion of additional work indicated. Each section closes with a series of tests of an objective nature. Provision is made for supplementary reading, oral report, dramatization, and manual expression, as well as the usual requirements in character and plot analysis.

SCHORLING, RALEIGH, CLARK, JOHN R., AND POTTER, MARY A. *Instructional Tests in Arithmetic*. Yonkers-on-Hudson, World Book Company, 1928. Fifth Grade, 57 pp.; Sixth Grade, 66 pp.; Seventh Grade, 65 pp.; Eighth Grade, 78 pp.; Teacher's Manual, 24 pp.

The market is evidently good for work books and other forms of instructional test materials. It is difficult for one interested in the teaching of arithmetic to keep acquainted with the rapidly increasing supply of tests, work books, practice pads, drill devices, or other types of material designed to facilitate instruction.

We need these new materials, however. Many of them represent progress and will displace the older materials as surely as the new and improved models in the automobile industry displace the models of a few years ago.

There is distinct evidence that the Schorling-Clark-Potter booklets are not arm chair products. Some of the practice materials which it has been the reviewer's privilege to examine can hardly be called worthy contributions. They could easily have been prepared by an office secretary who had been supplied with an outline of the kinds and numbers of examples to be included. The series under review, on the other hand, show the effects of painstaking care in the construction of examples, the organization of material by difficulty steps, the diagnosis of individual difficulties and the adaptation of instruction to individual needs. A Teacher's Manual gives 24 pages of directions and suggestions for utilizing the instructional test booklets to the best advantage.

Much of the material in this series is repeated from one booklet to another. A large amount of the material designed for the sixth grade, for example, is exactly the same as that already used in the fifth grade booklet. Usually the examples have been rearranged, thus concealing to the casual observer the identity of practice material, but in test after test the examples used in one booklet are exactly the same as those used in the other. Furthermore, the attainment goals are often given as exactly the same for the two grades.

In some cases this duplication is doubtless justified. Certain combinations of fractions must be added, subtracted, multiplied and divided, and the repetition of them rather than the use of fractions of less common out-of-school occurrence is no doubt desirable. But in other cases the reasons for repetition and duplication are not so clear. For example, Practice Test 62 in the sixth grade booklet contains exactly the same directions and content as Practice Test 62 in the fifth grade booklet. In each case the pupil divides fifths by eighths twice, the examples being $\frac{3}{5} \div \frac{1}{8} =$, and $\frac{1}{5} \div \frac{3}{8} =$. There are, however, fourteen other possibilities for practice on the division of fifths by eighths, using proper fractions. Why greater variety was not provided by using some of these fourteen in the sixth grade booklet is not clear. Whatever the reasons for duplication they should have been announced, and the fact of duplication acknowledged, in the Teacher's Manual.

It is the opinion of the reviewer that the booklets under review constitute a very valuable contribution to the work of grades five, six, seven, and eight.

R. L. MORTON

Ohio University

CLEM, ORLIE M. *A Work Book Syllabus in Principles of Education.* Baltimore, Warwick and York, 1928. 170 pages.

The fundamental maxim proposed by the author is that the college teacher of education should "practice what he preaches." All too frequently prospective teachers in schools of education are instructed in the use of techniques designed to train pupils to think, when as a matter of fact the instructor does not himself employ the method advocated, but on the contrary resorts to "parrot questioning" and is satisfied with "platter solutions."

With this maxim as a point of departure the author advances a procedure based upon the "Morrisonian technique" which he believes, with "slight change in emphasis," should be applied to all types of teaching from the elementary school to the University. The "work book syllabus" not only illustrates the procedure in the field of Principles of Secondary Education, but also is designed to serve as a text book for use in teachers college and university classes.

The entire field is divided into twenty units which cover rather more material than is ordinarily included in a course in this field. Instead of the traditional discussion of each unit, the author lists a long series of questions (in the case of certain units, as many as one hundred twenty-two) arranged in the order of relative difficulty. These questions are designed to stimulate reflective thinking and to bring about the "adaptation" sought. At the end of each list of questions is a bibliography which should aid the student in formulating his conclusions, and in evaluating a set of general principles. The questions also serve as the basis for class discussion in which the students are given much responsibility.

Professor Clem has performed a genuine service in calling attention to present weaknesses in college teaching. The needed reform may be found in some development of the unit plan as advanced by Professor Morrison. However, the reviewer is not convinced that an exhaustive set of questions, formulated long in advance of their use by an instructor, can possibly stimulate any great amount of reflective thinking on the part of students. Certainly for a college teacher to follow the questions of the "work book," would be as stereotyped and deadly as the procedures which the author very properly condemns.

H. B. ALBERTY

Ohio State University

HUDELSON, EARL. *Class Size at the College Level.* Minneapolis, The University of Minnesota Press, 1928. xxi + 299 pp.

At last the question of relative efficiency of large classes and small on the college level is being lifted out of the fog of speculation and submitted to experimental technique. It is interesting to find the report of an experiment in a great university along the lines which university men in education have been fostering and conducting in elementary and secondary schools for many years. It is encouraging to find an institution in which the faculty will join in such an experiment and to note that the findings are being faced frankly, even though they conflict with popular opinion.

Dr. Hudelson and his committee has rendered a most significant service in placing at the disposal of college and

university people everywhere the technique and results of their experimental work. The volume does more than this. In the first place it reviews very carefully practically all of the earlier studies on class size conducted in elementary and secondary fields since the work of J. M. Rice in 1896. Twice as many studies have been reported since 1920 as in all the years previous to that time. The general conclusion, on the basis of all these studies, is three-fold: "(1) That class size is not a critical factor in educational efficiency. (2) Teachers probably vary in their ability to handle large and small classes and (3) Any change in class size policy should be carefully prepared for before it is put into effect, for at best the necessary adaptations can be made but slowly."

The author then presents the adjustments made in colleges, universities and professional schools over the country to the increased attendance showing increase in both enrollment and number of teachers. An examination of the situation at Minnesota revealed different tendencies in different colleges and departments, some absorbing increased growth through increase in staff, others through increase in class size, and still others by an intermediate procedure.

The distribution of marks in certain courses over a period of years showed practically no difference in the proportion of marks given in large and small classes. What little difference did show up tended to indicate a slight advantage in favor of large sections. Testimony was secured from both students and faculty regarding the advantages and disadvantages of large and small classes. Both groups tend to agree that in small classes there is more personal contact with resulting more efficient work and better marks. As previously stated, an examination of the marks failed to confirm this opinion of students and faculty.

Finally, a large number of controlled and semi-controlled experiments were carried on involving 108 classes under 21 instructors in 11 departments of four colleges. More than 6000 students were involved. Seventy-eight percent of these experiments revealed a more or less decided advantage in favor of the large sections. At every intelligence level the paired students in the large sections excelled their mates in the small ones.

As stated earlier, the volume is a distinct contribution to higher education. More completely than ever before experimental evidence is now available regarding the relationship between size of class and efficiency of instruction as judged by the achievement of pupils. While much more investigation needs to be carried through to answer numerous questions regarding other advantages besides scholastic achievement which accrue to the student; concerning the effect upon teachers; concerning the difference of subject matter in different fields with respect to this question; and more especially concerning the techniques of effective instruction,—the burden of proof must rest upon those who advocate small classes rather than upon those who recommend increase in the size of class as an economy measure.

E. J. Ashbaugh
Ohio State University

Kelty, Mary G. *Teaching American History in the Middle Grades of the Elementary School.* Boston, Ginn and Company, 1928. 748 pp.

After a discussion of educational trends, principles of the basic technique, and details of administering the technique, the author furnishes a detailed outline of units in American History together with six illustrative lessons. In each unit, preparation for the overview,

presentation (or overview), readings for assimilation, lists of minimal essentials, suggested illustrative materials, and suggestions concerning organization and the recitation procedure provide the teacher with genuinely helpful material and guidance.

The great defect of the book is a lack of clear thinking in the handling of the unit idea or a failure to find words that clearly bring out the essentials of unity. This criticism may be understood by referring to Unit I: Why Men Wanted to Reach the Countries of the Far East. The outline shows:

I. Marco Polo told the People about China.

II. Men who went on the Crusades learned to like New Things to Eat and Wear.

Both these items are relevant. From this point, however, the materials do not answer the question which is supposed to unify the study. The next thing we read is:

III. Some went in Ships and Some on the Backs of Camels.

Even a pupil in the intermediate grades ought to be able to see that a statement of methods of transportation does not tell why men wanted to reach the Far East.

The rest of the so-called unit takes up Prince Henry, the Northmen, things that made travel easier, and the great idea of Columbus,—all of which are entirely outside the scope of the unit as expressed in the heading.

The unit method in history is very hard to handle, and perhaps Miss Kelty has done as well as is humanly possible. Still it seems to the writer of this review that: (1) If the unit heading involves a question (expressed or implied) each subdivision of the outline should be phrased as an answer to that question; (2) If the topic form of heading is used, each item should be clearly subordinate to that topic,—not irrelevant matter added to secure encyclopedic treatment of a period.

If Longfellow, Poe, Hawthorne, ether, Horace Mann's improvement of the school system, and Perry's visit to Japan are to be included in a study of "How the Slavery Question almost split the Nation into two Parts" (p. 435), what does *unit* mean?

A further example of lack of clear thinking is found in Appendix C, where the list of *persons* includes such terms as British, Dutch, French, Spaniards, Spanish, and homesteaders.

In spite of the serious defect which has been pointed out, this work by Miss Kelty will undoubtedly be a real aid to teachers. Her presentation is so far beyond general practice that it seems almost ungracious and unappreciative to offer any criticism at all.

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Lindsay, E. E. *Problems in School Administration.* The Macmillan Company, 1928. 544 pp.

This is an attempt to combine the problem or work book idea with the traditional idea of making a textbook. Practically the entire discussion and all the problems and exercises are fiscal. Apparently the author assumes that fiscal problems are the most common, persistent and baffling of all the multitudinous problems with which the school administrator must deal. As a textbook on financial problems the book is a contribution. In fact, the title of the book should read, *Fiscal Problems in School Administration.* But the reader will search in vain for problems on the program of studies, the curriculum, pupil-

personnel, staff personnel (except salary aspects) and various other fields that should be covered in a thorough treatment of School Administration.

There are 18 chapters, 125 problems, about 50 pages of graphs and tabular matter, and a very complete index. On financial matters, the book is an excellent treatment for the beginner for which it seems to be chiefly designed.

The attempt to combine the problem and the work book idea is the novel feature of the book. The chief difficulty with this combination is to have the subject matter of the chapter useful in solving the problems at the end of the chapter. The author succeeds in doing this better than in any other book I have seen.

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O'SHEA, WILLIAM J. The Twenty-Ninth Annual Report of the Superintendent of Schools, City of New York, 1926-27. 794 pp.

Dr. O'Shea states that "the review and appraisal of the great service rendered by our city schools requires a comprehensive report," and he has undertaken to give this as concisely as possible in this volume. He notes that "the ideal of our most enlightened business corporation is the ideal of service. Therefore this ideal of service is an organizing and controlling thought in our public school system." He points out that the system contains about 35,000 teachers and 1,000,000 students, has a capital investment of $346,500,000, and that each year the system adds approximately 20,000 pupils, 1,000 teachers, and 15 to 20 million dollars to its investment in sites and buildings. The schools, according to Dr. O'Shea, serve every kind of child,—blind, the crippled, the bright, the normal, the slow, the mentally defective—according to their needs and abilities and renders health service, social service, and spiritual and moral service.

The report contains a valuable discussion of teaching pupils how to study, an account of the school campaign for the safety of children, and the progress report of the committee on revision of the elementary course of study. The first part discusses high points in educational progress and the second part contains a mass of statistics prepared by the director of reference, research and statistics.

The committee on revision of the course of study has been working for two years with a large number of teachers, principals, and supervisory officers, giving much time to the work. The guiding principles presented by the chairman of the general committee to the sub-committees and those which guided the general committee in their critical analyses of the proposal of sub-committees are set forth in considerable detail. Modern tendencies in the subject, a statement of aims and objectives, a consideration of content, the use of tests and measurements, and methodology all come in for their contributions to the work.

The statistical part of the volume presents data which will be of particular value to students of education interested in checking trends of educational development in larger cities. The discussion of high points will be of interest to those who are on the look-out for the newer things that are being attempted and the places where certain activities have been especially well done. The most valuable contribution, however, will doubtless be found in those pages devoted to the revision of the course of study, because of the explicit way in which guiding principles are set forth.

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RESEARCH ABSTRACTS and BIBLIOGRAPHIES

Address all communications relative to research abstracts and bibliographies to Editor A. S. Barr, University of Wisconsin, Madison, Wisconsin.

ADAMS, JESSE E. *A Study in the Equalization of Educational Opportunities in Kentucky. Bulletin of the University of Kentucky*, Lexington, Kentucky, 1928.

The purpose of this study was to: (1) to show a ranking of the counties of Kentucky in educational achievements; (2) to reveal the great educational inequalities in Kentucky; (3) to suggest a plan whereby the inequalities in educational opportunities in Kentucky may be lessened. The data are taken from the various state reports. The report contains chapters on: the holding power of the Kentucky Public Schools; other factors bearing upon the efficiency of the Kentucky public school system; what Kentucky public schools are costing; the burden imposed by the support of schools; the ability of the various counties to support education; ranking of the counties on achievement, effort, and ability; plans for equal educational opportunity.

CURTIS, FRANCIS D. *A Synthesis and Evaluation of Subject-Matter Topics in General Science.* Boston: Ginn and Company, 1929.

The investigation aims to combine the data from analytical researches by means of appropriate statistical technique to determine the relative value of various types of subject matter. The sources of data are syllabi, analyses of textbooks, analyses of scientific interest reports, analyses of newspapers and magazines, analyses of commodity consumption, and committee reports. A final table presents an evaluation of general science topics based upon the several sources named.

ODELL, C. W. "A Selected Annotated Bibliography dealing with Examinations and School Marks." *University of Illinois Bulletin*, Bulletin No. 43, Bureau of Educational Research, College of Education, University of Illinois, 1929.

The bibliography is grouped under the following headings: General Discussions; Traditional Examinations; New-Type Tests; School Marks; and Prevention of Cheating.

SAVAGE, HOWARD J., AND COGSWELL, EDMUND S. *A Retirement Plan for Colorado Public Schools.* New York: The Carnegie Foundation for the Advancement of Teaching, 1928.

A study made at the request of the Colorado Education Association and the State Department of Public Instruction setting forth a retirement plan for the Colorado Public Schools.

WHEELER, CARLETON, A. *et al. Enrollment in the Foreign Languages in Secondary Schools and Colleges of the United States.* New York: Macmillan Company, 1928.

The report on the enrollment in the Foreign Languages in Secondary Schools

and Colleges in the United States is the fourth of a series of volumes reporting the results of the Modern Language Study. This volume is reported in two parts.

Part I deals with the enrollment in the foreign languages in public and private secondary schools; Part II with the enrollment in the Modern Foreign Languages in colleges and universities. The report contains data upon enrollment and its relation to size of school, types of communities, and types of schools; combinations of languages; year of study, etc. The report presents extensive and detailed data upon enrollment in the Foreign Languages in secondary schools and colleges in the United States.

EXPERIMENTAL STUDIES REPORTED IN CURRENT ISSUES OF OTHER MAGAZINES

EDUCATIONAL ADMINISTRATION AND SUPERVISION

COOK, INEZ M., AND GOODRICH, T. V. "How High School Pupils Spend Their Time." *The School Review*, XXXVI (December, 1928), 771-778.

A study of how one thousand sophomores, juniors, and seniors in the Lincoln High School, Lincoln, Nebraska, spend their time. The authors conclude that:

"1. The attitude of the average teacher toward pupils is reasonable and sympathetic, as shown by the generous provision in the recommended daily schedule for recreational and social activities sponsored by the school and for wholesome activities outside the school.

"2. The variation in the amount of time teachers think pupils ought to devote to most activities is nearly as great as the variation in the amount of time the pupils actually devote to these activities.

"3. While the pupil averages for nearly all the items are not far from the averages of the teachers' expectations, there are a few pupils at both ends of the distribution who need individual adjustment.

"4. As to home study, this investigation would indicate that no general reform is needed. On the other hand, however, a small percentage of pupils are doing little or no home study, while, on the other hand, a small percentage of pupils are doing an excessive amount. The problem appears to be one of individual adjustment, not one of group adjustment.

"5. It may be possible to make the worth-while activities in which pupils voluntarily engage contribute more to the aims of education. It may be that to increase school influence in that field would be more worth while than to secure more time for formal study at the expense of curtailing those activities."

ELLEDGE, LELA M. "Present Requirements for Teachers of Subnormal and Superior Children." *The Elementary School Journal*, XXIX (December, 1928), 303-306.

A questionnaire study based upon 228 returns for 4,148 teachers. A very small percentage have the qualifications necessary according to the replies to the questionnaire.

GOLDBERG, BRONETT, AND PRESSEY, LUELLA. "How Do Children Spend Their Time?" *The Elementary School Journal*, XXIX (December, 1928), 273-276.

A study of how children spend their time based upon data for 309 children in the fourth, fifth, and sixth grades in two

different schools. The items studied included the time spent in sleeping, eating, dressing, amusements, school, lessons, work, social events, and miscellaneous to which the following amounts of time (hours) were given, 9.7, 1.0, 0.9, 2.4, 7.0, 0.5, 1.6, 0.1, 0.8, respectively.

HALL, C. W. "A Study of a Group of Early-Leaving High School Pupils." *Educational Research Bulletin*, College of Education, Ohio State University, VIII (January, 1929), 6-18.

A study carried on to provide data for the organization of special courses in the Collinwood (Ohio) High School for groups of pupils who have no intention of graduating from the regular senior high-school course. The following information was sought: (1) the number of children in the family; (2) home ownership; (3) occupation of the father; (4) the pupil's occupational ambition; (5) his attitude toward school; (6) the parents attitude toward school; (7) alleged reasons for withdrawal; (8) the counselor's judgment as to the reason for withdrawal; (9) the attitude of both the pupil and his parents toward the school's adjusted program. The report contains tables and data for each of the topics listed.

MCNEELY, JOHN G. "The Activities of Junior High School Principals in California." *California Quarterly of Secondary Education*, (January, 1929), 156-165.

A questionnaire study of the activities of junior high school principals in California.

CURRICULUM CONSTRUCTION

BECK, MAE MILLER. "The Vocabulary of First Readers." *Peabody Journal of Education*, VI (January, 1928), 224-227.

A study of the vocabulary of eight beginning readers. A child reading these eight books would meet 1,336 different words, of which 706 would appear in only one book, and 42 of which would appear in all eight books.

BRUNER, HERBERT B. "Determining Basic Reading Materials through a Study of Children's Interests and Adult Judgments." *Teachers College Record*, XXX (January, 1929), 285-309.

An attempt to determine experimentally and statistically basic reading materials for grades 4, 5, and 6. According to the two-fold standard of interest and appropriateness. The study is subdivided into five phases: (1) A study of the spontaneous questions of children; (2) A study of the interest of children as judged by their reaction to questions formulated by subject matter specialists; (3) the preparation of materials on the basis of the judgment of adults to satisfy the interests of children; (4) determination through adult judgment the most appropriate literary prose selections; and (5) the determination through classroom experimentation the interest and appropriateness of the literary and informational materials. Fifteen hundred teachers, 50,000 children, over a hundred student critic teachers and a number of interested parents coöperated in the experiments. The article contains lists of reading materials suited to children of grades 4, 5, and 6.

CUTRIGHT, PRUDENCE, HALVORSON, GEORGE P., AND BRUECKNER, L. J. "A Study of One Factor in the Grade Placement of Reading Materials." *The Elementary School Journal*, XXIX (December, 1928), 284-295.

A study of grade placement of reading materials in relation to difficulty of

comprehension. Using Spyri's *Heidi* objective tests, one of vocabulary and another of comprehension, were developed. The tests were given to 109 pupils in grade IV B who had not read *Heidi;* to 121 pupils in grade IV A who had read the story; and 52 pupils in grades V A, VI B, and VI A in a school where *Heidi* had not been used at all. The procedure used gave the authors a measure of the difficulty of the selection studied.

KNIGHT, F. B. "Analyzing the Distribution of Drill in Fractions." *The Journal of Educational Methods*, VIII (January, 1929), 1205-211.

A discussion of methods of analyzing fractions for drill purposes.

NUDELMAN, EDWARD A. "Pupil Exercises Used in Elementary History Textbooks." *The Elementary School Journal*, XXIX (January, 1929), 351-357.

Six textbooks, five comparatively recent ones and one older text, were analyzed in detail. The exercises found in these books were listed under thirty different types. While textbook writers differ greatly among themselves as to the types of exercises introduced, present-day textbooks exhibit greater variety in the choice of exercises than did older textbooks. There is a predominance of exercises of the question and answer type.

EDUCATIONAL PSYCHOLOGY

BROOM, M. EUSTACE. "Sex Differences in Achievement in Modern Languages as Measured by Standardized Tests." *California Quarterly of Secondary Education*, (January, 1929), 125-128.

Data is presented for several thousand cases for ability to comprehend the meaning of the printed Spanish language, for a test of Spanish-English vocabulary, and for ability to comprehend the meaning of the printed French language. The author concludes: "The differences between median scores for boys and for girls as yielded by three standardized tests are always small. The reliability of these differences is sometimes of sufficient value to indicate the existence of a reliable difference. Such reliable differences sometimes favor boys and sometimes girls. The only fact that is shown with any certainty by the study is that neither sex group has a clear advantage over the other in the skills measured by the three standardized tests. Boys and girls, then, should be taught the same amounts of subject matter in the foreign languages in the same periods of time, and their achievement should be judged by the same qualitative and quantitative standards until we have information justifying different procedures."

LENTZ, THEO. F. "Sex Differences in School Marks with Achievement Test Scores Constant." *School and Society*, XXIX (January 12, 1929), 65-69.

A study of 390 pupils, 188 girls and 202 boys in grades two to six. Girls make higher school marks in four out of five classes but have higher standard achievement scores in only one class.

RUGG, HAROLD, KRUEGER, LOUISE, AND SONDERGAARD, ARENSA. "Studies in Child Personality: I—A Study of the Language of Kindergarten Children." *The Journal of Educational Psychology*, XX (January, 1929), 1-18.

A detailed analysis of the language behavior of twenty-seven kindergarten children by the eye-witness technique to discover the predominant personality traits of kindergarten children as re-

vealed by their language. The conversation of each of the twenty-seven children was recorded in three fifteen-minute periods: (1) In outdoor play; (2) in the work period; and (3) in luncheon period. Three thousand one hundred and twenty-five remarks were recorded altogether. From an analysis of these remarks the writers conclude the kindergarten child is essentially a self-assertive individual; that he is a linguistic experimentalist, that he reveals only slight evidences of intellectual curiosity and little interest or ability in more than the simplest forms of perceptual thinking.

The dominance of these individual traits suggests two procedures for the elementary school. One is to preserve, so far as possible, the developing individuality; the other to bring the individual into a growing social consciousness—that is, to increase the interplay of personality upon personality. The authors suggest that neither procedure is complete without the other.

STUDIES OF TEACHING AND LEARNING

DVORAK, AUGUST, AND RAE, J. J. "A Comparison of the Achievement of Superior Children in Segregated and Unsegregated First-Grade Classes." *The Elementary School Journal*, XXIX (January, 1929), 380-386.

An experimental study of the achievement of superior children in segregated and unsegregated first grade classes carried on at Caldwell, Idaho, with 110 cases. The authors conclude that when methods and materials are adapted to the needs of homogeneous groups the results are positive but where there is mere segregation the results are negative.

MALONEY, ESTELLE L., AND RUCH, G. M. "The Use of Objective Tests in Teaching as Illustrated by Grammar." *The School Review*, XXXVII (January, 1929), 62-66.

A study of the effectiveness of objective tests as teaching materials based upon data secured for 497 pupils in the ninth, tenth, and eleventh grades. The test method was shown to be superior.

NEAL, ELMA A., AND FOSTER, INEZ. "An Experiment with Remedial Work in Common Fractions." *The Elementary School Journal*, XXIX (December, 1928), 1280-283.

An analysis of the types of examples found in common fractions was made. From this analysis diagnostic tests and practice exercises were developed. By use of experimental groups (639 pupils for the Stanford Achievement test, computation; and 647 pupils for an informational fraction test) and control groups (397 pupils for the Stanford Achievement test, computation; and 417 pupils for an informational fraction test) a comparison was made of these material groups taught by the usual drill procedures. The practice materials were more effective; the experimental group showing a gain of 24 points as compared with a gain of 16 points made by the control group in the computation test and a gain of 12 points as compared with 8 points in the information fraction test.

NEWS and COMMUNICATIONS

Address all research news and communications to Editor Earl Hudelson, College of Education, University of Minnesota, Minneapolis, Minnesota.

In the July 1928 issue of *The New Era*, the English organ of the New Education Fellowship, Mrs. Beatrice Ensor, the editor, reports her impressions of a three months' educational visit to the United States. She summarizes her impressions as follows:

"In summarizing my impressions of progressive education in the States, four points stand out clearly in my mind as vital contributions to our pioneer work. First and foremost there is the deep, underlying philosophy of Dewey, which in theory permeates all American educational adventure. Then there is the new, scientific child study. Growth, whether physical, mental, or even moral, is tested, analyzed, and measured in order that it may continue without inhibitions, and that educational practice may not remain dependent entirely upon the intuition of a few gifted teachers, but be supported by scientific principles. All work in the study of education, both as a science and as an art, is greatly facilitated by the coöperation of parents, teachers, and psychologists in this crusade on behalf of youth. Parents, as well as teachers, take an intelligent interest in education and belong to associations which stand for progress. The parents themselves are urging forward educational research, are demanding new conditions for their children, and are often instrumental in founding progressive schools. Again, all the progressive educators, whether parents or teachers, keep abreast of the times. They seem first in all our European educational development. They read, travel, discuss, argue, and push ahead with dynamic energy worthy of the pioneer. In England we are proud of our traditional stability. They are proud of their traditional urge to move forward, to explore virgin soil, or, in the words of Browning's *Paracelsus:*

'To follow knowledge like a sinking star
Beyond the utmost bounds of human thought.'"

A course in the history of living religions is included in the curriculum of the Topeka, Kansas, Senior High School. It is a two-semester course and is open to juniors and seniors. The subject was introduced during the spring term of 1926-27, with an enrollment of twenty-seven. Last year the enrollment increased to sixty.

A new research organization, the Institute of Women's Professional Relations, has recently been established with headquarters at the North Carolina College for Women, Greensboro, North Carolina. It is under the direction of a Board sponsored by the American Association of University Women but financed by a group of private individuals. The Institute has a five-year program of research looking toward the coördination of business and professional requirements with women's education, the cultivation of greater interest in preprofessional courses, and the profitable entrance of women into various fields such

as merchandising, finance, and specialized professional service. In addition to its research, the Institute will act as a clearing house covering the activities of the college guidance bureaus and of research and other agencies interested in the work and education of women. No placement work is to be done. The Director of the Institute is Mrs. Chase Going Woodhouse, Vocational Director of the North Carolina College for Women.

The Minister of Public Instruction of Denmark has decided to appoint a commission for submitting a proposal for the complete reorganization of the secondary educational system. This commission will be instructed to elaborate its recommendations on the following basis: The reorganization of the higher courses of the secondary schools so that the term of the gymnasium will be four years instead of three and the term of the real schools will be two years instead of one. The proposals further contemplate the abolition of the middle-school examinations, although retaining the middle school itself as a three years' course coming after that of the public school.

Catholic high schools are supplying more than half the freshman students attending Catholic colleges in the United States, according to a survey recently completed by the National Catholic Welfare Council. Reports show that of 10,317 freshman students attending 132 Catholic colleges, 6,169 students, or 59.8 percent, came from Catholic high schools; and 4,148, or 40.2 percent, came from public high schools. In the 63 Catholic colleges for men, having a total enrollment of 7,068 freshman students, 4,080, or 57.7 percent, came from Catholic high schools; and of the 3,249 freshman students in 69 Catholic colleges for women, 2,089, or 64.3 percent were from Catholic high schools. Fifteen colleges reported that all their freshman students had come from Catholic high schools.

Retail Selling, a two-year course open to third and fourth year girls in Eastern and Western High Schools, Baltimore, Maryland, is given in coöperation with seven important department stores which serve as laboratories for the course. The girls spend one afternoon a week and every Saturday, as well as the entire week preceding Christmas, as regularly employed workers in the stores to which they are assigned. Names of the practice girls are on the payrolls of the stores and they do real work as saleswomen. The stores, to some extent, assume responsibility for instruction in their training departments or "on the job." Following each period in the store, oral or written reports are required which furnish the basis for class discussion and instruction in the responsibility and technique of salesmanship. A somewhat different form of training in service is carried on in several of the large department stores of the city for employed boys and girls, who receive regular instruction by public school teachers assigned to this special work.

To help create a citizenry informed on the accomplishments and needs of its schools, the Board of Education of Denver is issuing a series of monographs. The educational world is already familiar with the work that has been done on the curriculum in Denver, reported in Monograph Number 12, entitled *The Denver Program of Curriculum Revision*. A recent addition to the series is Monograph Number 13, entitled *The Denver School Building Program*. Chapter V presents the criteria which have guided the author-

ities of Denver in their building program.

President George W. Frasier of the Colorado State Teachers College, Greeley, has recently announced the following new policy concerning admission to the College:

"In keeping with the best educational thinking of the day and as a result of careful experimentation over a period of four years, the College has decided to admit any high-school graduate who is recommended by his principal or superintendent and who has health, character, and ability to do college work. This College believes that the high-school curriculum is a high-school problem, and we shall make no attempt to dictate specific subjects of study required for graduation and admission to college. Our experience demonstrates that an applicant, to succeed in our College and as a teacher later in life, should have (1) a good high-school record; (2) a good moral character; (3) good health; and (4) ability to do college work. The last is determined by scores made on certain tests at the time of matriculation (English, intelligence, achievement, and teaching aptitude)."

Accompanying the announcement is a digest of evidence supporting the new policy.

"Educational Measurements" should be an *introductory course* for men and women who will occupy places in the educational world. But all such individuals are not going to occupy the same place—there is a diversity of aims and intentions on the part of the students together with the gross discrepancy in their previous training. Such differences have probably more than anything else led to the multiplicity of aims in the course itself, but needlessly so. The obvious impossibility of satisfying the exact needs of all these students, or the instruction in their favorite departments, should be, in itself, justification enough of the professor's own outline of his course.

Our course, then, at its best, would be an appreciatory course, and should stand, in order to eliminate the encroachment of specific training courses of definite professional application, as the prerequisite of the four allied one-semester courses, outlined as follows:

1. Intelligence testing, individual and group.
2. Accomplishment tests.
3. Advanced statistics, including advanced mathematical treatment with the derivation of formulas.
4. The testing of defective and psychotic individuals — a clinical course.

Such intensive training in these four fields, allied but by no means identical, would equip the student for the position of school psychologist or clinician. Such equipment is necessary and would on the one hand forestall the current attempt to cram these studies into the course of educational measurements and on the other hand would prevent an educational measurement graduate from assuming responsibilities for which such a mixed course would lead him to believe himself fitted.

The educational measurement course, itself, should be a course of about ten weeks duration with three hours per week, a fifteen weeks period with two hours per week, or, as is the practice in our summer schools, a six weeks period of instruction entailing five hours per week. In any event we have thirty hours in all.

The subject matter we would divide into three separate blocks of ten recitations each, as follows:

I. Historical and evaluatory introduction.

II. Statistical treatment and interpretation.

III. Systematic and intensive study of the best tests in the various fields in which objective tests have been used.

In our outline of the course, given below, it will be noted that we treat the various aspects of intelligence testing (history, scoring, interpretation, etc.) simultaneously with the corresponding treatment in the field of accomplishment and character tests. We see no reason, in an introductory course of this nature, why accomplishment tests should be given the preference over intelligence tests, a procedure which is frequently followed at the present time. The advanced courses, outlined above, are to emphasize both aspects in their respective places.

The first block of our course, comprising the instruction in the first ten recitations, would treat the following information:

HISTORICAL AND EVALUATORY INTRODUCTION

Hours I and II

History of Testing

A. Early attempts.
B. History of intelligence tests.
C. History of accomplishment tests.
D. History of practice and character tests.

Hours III and IV

Present day need of educational tests

A. Inaccuracy of teacher's marks.
B. Necessity of knowing the educational and mental levels of all pupils.
C. Consistency with a progressive philosophy of education.
D. Value of objective standards.
E. Importance of intelligence and accomplishment tests.

Hours V and VI

Criteria of good tests.
Shortcomings of all tests

a. Educational
b. Intelligence

Hours VII and VIII

How tests are made

Historical data on the standardization of various tests and the problems met with.

Hours IX and X

1. The uses of objective tests.
   A. Technique in giving tests.
      a. Intelligence
      b. Accomplishment.
   B. Scoring Tests.

2. At this point it would be well if the members of the class should give in a school one group intelligence test and one accomplishment test; e.g., arithmetic. (Furthermore these scores can be used in the second part of the course which immediately follows.)

3. Redistribution of pupils.
4. The use of the tests by the clinician.

The above introduction would be carried out by means of lectures and collateral reading. No attempt, at this time, should be made to know specific tests.

The second block of ten hours should be an introduction to statistical treatment and interpretation. This phase of the course should enable the student to read with intelligence the various psychological and educational data found in the publications in these fields.

Hours XI, XII, and XIII

1. Finding the MA and IQ and their significance and shortcomings.
2. Distribution.
3. Measures of central tendency.
   a. Mean
   b. Mode
   c. Median

Hours XIV, XV and XVI

Measures of variability

1. Quartile deviation.
2. Mean deviation.
3. Standard deviation.

Hours XVII and XVIII

Relationships

1. Rank difference
2. Pearson product moment.

Hours XIX and XX

1. Reliability.
2. Application of statistical methods to the scores obtained by the class in testing school children.
3. Summary of statistical methods given.

The above phase, statistics, has received its due emphasis in this third of the course and is placed in the second third of the course rather than the first because we believe an introduction, such as outlined above, is necessary if the student is to appreciate their significance. There is also the unfavorable psychological effect that the former method may bring forth. This immediate immersion into statistics is followed, however, by many instructors in this field. Again, we put statistics in the middle third rather than the last third of the course because (1) it will be valuable in the study of specific tests, and (2) the due importance of statistics may be lost if given only at the end of the course; i. e., it may be that the student will feel that statistics are of but questionable value, being relegated to the final phase of the course.

The third block of the course, a systematic study of the best tests in the various fields of education, is outlined as follows:

Hour	
XXI	Intelligence (emphasis on group intelligence tests).
XXII	Reading.
XXIII	Writing.
XXIV	Arithmetic.
XXV	Spelling.
XXVI	Social Studies.
XXVII	Practice Tests.
XXVIII	Character Tests.
XXIX	Future of testing.
XXX	Review of course.

In dealing with these tests the instructor should attempt to familiarize the student with the two or three best tests in these fields. This will be especially helpful to those students who are to be the school administrators of tomorrow, and who will undoubtedly be faced with the problems of selecting the right tests for their school systems. Above all, an exposition of the effect that tests have had on the teaching and the organization of the subject matter itself should be given, thus showing a further contribution of the tests to the educational world.

In the above comments on the course, "Educational Measurements", with the course subsequently outlined we have attempted:

1. To free such a course from the overemphasis of certain aspects of education, coming from other fields or from the personal likes and dislikes of the professor.

2. To eliminate the multiplicity of aims seen in such various courses in various institutions. This has been done by:

   a. An analysis of the students taking such courses.

   b. Relegating to other specific courses that professional training which such a course as educational measurements cannot adequately give.

3. To establish educational measurements as an introductory course, as it is our opinion that it should be after an analysis of the students enrolled and of the subject matter which will be of value to them once they are in the field.

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